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ALUMINUM WIRE SPRAY METALLIZING SHIPBOARD COMPONENTS FOR CORROS--ETC(U)
JUL 78 W H STANDLEY, M D SCHMELLER
UNCLASSIFIED PSNS-WER-0161 NL

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WELDING ENGINEERING REPORT 0161

ALUMINUM WIRE SPRAY METALLIZING SHIPBOARD COMPONENTS FOR CORROSION RESISTANCE, USS William H. Standley CG-32

18 JUL 1978

391 510

Puget Sound Naval Shipyard
Bremerton, Washington

13ND PSNS 3650/3

9 **WELDING ENGINEERING REPORT, #0161**

Subject: 6 **Aluminum Wire Spray Metallizing Shipboard Components for Corrosion Resistance, USS William H. Standley CG-32**

Enclosure: **(1) Welding Procedure #0159 With Addendum**

(2) Spraying Log 10 William H./Standley Mark D. /Schmeller

Figures: **1 thru 6. Pulled Tensile Specimen Photographs**

7 and 8. Bend Specimen Photographs

12 92 p.

9 thru 12. Microphotographs of Spray Cross Sections

13 and 14. Flow Charts of Production Spraying Sequences

15 thru 66. Photographs of Various Stages of the Spraying Sequence as Follows: 14 PSNS-WER-0161

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15,16,17------------------Typical condition of valves and components when removed from the ship

18-----------------------New valve as received

19,20--------------------Closeup views of difficult areas to spray

21-----------------------Removing name plate

22-----------------------Disassembled valve ready for degreasing

23,24--------------------Method of maintaining hand wheel, bushing nut, nameplate, etc. identity for later reassembly

25-----------------------Maintaining log book and Process Operation Sheet

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26,27-------------------Vapor degreasing in triclorothane tank

28,29,30,31-------------Masking prior to grit blasting and spraying

32,33-------------------Grit blasting with aluminum oxide

34,35,36----------------Surface appearance after aluminum oxide grit blast

37,38,39,40,41,42-------Aluminum spraying sequence--Preheat, measuring preheat, metal spraying, temperature measurement after spraying and measuring spray thickness with Elcometer

43----------------------In process inspection by supervisory personnel

44,45-------------------Applying sealer to sprayed components

46----------------------Sprayed and sealed components with process operation sheets attached

47----------------------Sprayed valves ready for reassembly

48,49-------------------Valves during assembly process

50----------------------Coating protection from vice jaws during assembly

51,52,53----------------Spray coating damage during valve assembly and the repair by sealing

54----------------------Completed valve ready for installation

Dark spot on valve body is red spray paint

color code for chrome molybdenum valve body

55----------------------Completed valves ready for transport to ship

Cardboard dividers for coating protection

56----------------------Another method of transport to ship

57,58-------------------First stages of installation. Note valve nozzles masked from spray to accomodate welding. Bubbling of sealer was caused by high welding heat input. Lower heat inputs alleviated this condition.

59,60,61,62,63,64,65-----Installed valves and components

66----------------------Non metallized new valve installed approximately one month before photograph. Note corrosion spots already forming

1. Puget Sound Naval Shipyard was tasked by COMNAVSEASYCOM to develop a procedure, qualify personnel, and aluminum spray metallize as many valves and selected other parts as practical in the main propulsion system of the USS William H. Standley CG-32. A total of 571 valves, 15 safety valve caps, eight boiler access doors, and eight small pipe assemblies were sprayed during the course of this research and development project. The project was undertaken to provide a documented, representative test of sprayed aluminum as a corrosion control method.

2. Two meetings were conducted at PSNS on 23 and 24 March 1978 to discuss the merits and feasability of metallizing Standley valves on a not to interfere with production basis. The meetings were attended by approximately twenty people representing shops 926, 931, 956, 938, 971; Codes 138, 213, 231, 332, 385; USS Standley; NAEC; SURFPAC; NAVSEC; and NSRDC. The consensus was that PSNS could spray the valves in a timely manner and obtain sufficient data required for this research and development project.

3. Welding procedure #0159 and its addendum (enclosure 1) were written to accomplish personnel qualification, provide instructions for metallizing the production valves, and provide quality assurance requirements. The welding procedure was reviewed and concurred in by representatives of SURFPAC (Bob Sulit), NSRDC (Vincent Schaper), NAEC (Mike Bless), and NAVSEC (Frank Vapniarek).

4. The production spraying of the valves presented some problems that were overcome and ~~the following~~ recommendations are ~~presented:~~ included.

(a) The small valves, ¼" thru 2", were completely disassembled prior to cleaning and grit blasting. New valves that were protected with cosmoline were very difficult to thoroughly vapor degrease unless all of the parts were disassembled. When the project was nearly completed, a less time consuming method was initiated. This method consisted of baking the entire assembled valve at approximately 600°F to remove the grease. Then a cotton plug was inserted into the inlet and outlet over which a rubber stopper was inserted. The stem was masked using a rubber hose pushed down into soft RTV silicone rubber that had been placed in the packing gland. After about 24 hours, the RTV was sufficiently set up to allow blasting. Preliminary blasting with sand or slag removed solidified grease residue and other contaminents and then aluminum oxide blasting established the anchor pattern on the final blast.

(b) The best material found for masking the valve internals for protection from sandblasting is the standard rubber laboratory stopper. The cotton plug under the rubber stopper insured protection of valve internals from foreign material.

(c) Stud threads may be sprayed provided no more than three threads protrude through the nut, or the fit of nut to stud is reasonably loose.

(d) The production line for metallizing should be in one concentrated area and consist of spaces for disassembly/reassembly, masking, vapor degreasing, baking, grit blasting, metallizing and sealing.

(e) Oil seepage from pores in the casting or from bearing/faying surfaces has been the only cause for any non-bonding of the spray. This condition occurred on thirty-nine of the 571 valves sprayed as indicated by the "reject" indication in the spraying log (enclosure 2). Partial correction of this condition was accomplished by completely disassembling the smaller valves, vapor degreasing the parts and reassembling degreased parts for the grit blasting cycle. Later in the project, baking and improved masking techniques alleviated this problem. Where oil seeped from casting porosity in one of the large reworked valve bodies, successful spraying was accomplished after baking the valve body at 500°F, blasting off unbonded spray and respraying.

(f) Valve identification was maintained with the use of material delivery records, stamped numbers on body/bonnet flange as shown in Fig 54, and a round metal tag with FAS stamped on it and securely fastened to the part as shown in Fig 62.

(g) Application of the sealer on all of the valves was by brush. Spraying the sealer would be better if a work area is set up for spray painting.

5. The materials used during the project were frequently checked and the following observations were made:

(a) The aluminum oxide grit used for final blasting should not contain more than 25% fines (able to pass through a #50 sieve).

(b) The air used for spraying should have a dew point of $+15^{o}F$ or less to assure relatively dry air for spraying.

(c) The final blast and spraying air should not contain more than .04 ppm oil vapor.

(d) The aluminum wire used was chemically analyzed and was found to be 99 plus percent pure aluminum (lab report #0800 of 4/7/78).

6. Qualification, tensile, bend and micro tests for the metallizing operators and in-process bend tests were conducted per the requirements of the spraying procedure. Five tensile specimens and one bend specimen were sprayed by each operator. The tensile specimens were one inch diameter 4130 material and sprayed with aluminum to a thickness of .010 to .026 inch. The sprayed surfaces of the tensile specimens were then trued by sanding, lightly sandblasted and bonded to un-sprayed specimens using 3M EC2186 epoxy adhesive. After the bonding cycle was complete the assembly was pulled to obtain tensile strength of the bond line between the spray and the substrate. The average tensile of 30 specimens was 6279 psi with the low being 1600 psi and the high at 11,100 psi. Only three tensiles of the 30 were below 3000 psi and no two came from the same operator. Figure 1 thru 6 shows the sprayed ends of the specimens after separation. The bend specimens exhibited very favorable results during severe bending. The aluminum spray ranged from .004 to .011 inch on the .050 inch think carbon steel bend test strips. After spraying, the samples were subjected to a 180^{o} bend around a ¼ inch radius with the spray being in tension. Approximately 50% of the forty samples had minor hairline cracking in the bend, three samples failed because of excessive cracking or flaking and the rest of the specimens were essentially free of coating discontinuities. Figures 7 and 8 are representative examples of the bend specimens. Microphotographs of the cross sectioned aluminum spray are depicted in Figures 9 thru 12. The micrographs indicate the anchor pattern, density and thickness of the spray. The cross sections were taken across the approximate middle of the three inch long bend specimen. Operator training was conducted on the job after oral indoctrination by Shop 926 supervision and Code 138. Spraying proficiency became apparent after about five valve bodies were completed.

7. All valves sprayed during this project were closely quality controlled during the entire cycle as shown in the spraying log (enclosure 2). Also a

process operation sheet was initiated for each sprayed item. The original of this sheet ultimately remains with ships force so future monitoring can be logged. An example of a completed process operation sheet is included with the addendum to the welding procedure in this report (enclosure 1). Figures 13 and 14 indicate the flow of production spraying. The sprayed valves will be monitored for the next six years by DTNSRDC for corrosion protection effectiveness of the aluminum spray.

8. The following ten one half inch carbon steel globe valves were chosen to collect data on an alternate stud material; class 422, 12% chrome, corrosion resisting steel of MIL-S-861:

(a) Auxiliary exhaust low point drain inlet valve, lower level, STBD, Fr 128, 20 feet from CL, aft fire room, subject to 15 psi, 450°F.

(b) Auxiliary exhaust low point drain valve (outlet from orifice), lower level, STBD, Fr 128, 20 feet from CL, aft fire room, subject to approximately 15 psi, 450°F.

(c) Auxiliary exhaust low point drain valve (stop check from orifice), lower level, STBD, Fr 128, 20 feet from CL, aft fire room, subject to 15 psi, 450°F.

(d) Auxiliary exhaust low point drain (inlet to orifice), lower level, lower case, Fr 136, 15 feet from CL, aft fire room, subject to approximately 15 psi, 450°F.

(e) Auxiliary exhaust low point drain valve (outlet from orifice), lower level, lower case, Fr 136, 15 feet from CL, aft fire room, subject to approximately 15 psi, 450°F.

(f) Number 2A main feed pump turbine casing drain valve (outlet from orifice), upper level, port, Fr 120, 20 feet from CL, aft fire room, subject to approximately 25 psi, 450°F.

(g) Number 2A main feed pump turbine casing drain valve (stop check after orifice), upper level, port, Fr 120, 20 feet from CL, aft fire room, subject to approximately 25 psi, 450°F.

(h) Number 2B main feed pump turbine casing drain valve (outlet from orifice), upper level, port, Fr 124, 12 feet from CL, aft fire room, subject to approximately 25 psi, 450°F.

(i) Number 2C main feed pump casing drain valve (outlet from orifice), upper level, port, Fr 124, 20 feet from CL, aft fire room, subject to approximately 25 psi, 450°F.

(j) Number 2C main feed pump casing drain valve (stop check after orifice), upper level, port, Fr 124, 20 feet from CL, aft fire room, subject to approximately 25 psi, 450°F.

9. A limited number of heat treated steel studs and nuts were also "Cermatil" coated and their installation locations will be addressed on the process operation sheet for the subject valve. "Cermatil" is a type of ceramic that will withstand thread pressure and corrosive conditions.

10. Manpower and material cost data will be supplied by PSNS planning codes and is not addressed in this report.

11. Figures 15 thru 66 depict the various stages of the spraying project.

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Head, Welding Engineering Division

CORROSION CONTROL OF VALVE BODIES BY METALLIZING

1. This procedure meets the requirements of NAVSEA 0919-LP-008-8010, Corrosion Control for Shipboard Launch and Recovery Systems, and shall be followed precisely when metallizing the valve bodies described in paragraph 2.

2. This procedure is applicable to the propulsion system valve bodies on the CG 32, USS STANDLEY.

3. Condition of Surface. In utilizing the wire spray method for the corrosion control of valves, a great deal of importance must be placed on the condition of the surface to which they are applied. A coating system is only as good as the care that was taken in its application, and the greatest portion of application time and effort should be devoted to surface preparation. It has been estimated that 90% of all coating failures can be attributed to poor surface preparation.

4. Cleaning the Surface. The application of a coating over a corroded surface should never be attempted. The corrosion products destroy the bond between the coating and the base metal. In addition, any moisture that is present in the corrosion product, no matter how minute, will cause further corrosion of the metal, and blistering of the coating will occur. The metal surface, often called the substrate, shall also be free from contaminants such as grease and oil. Even fingerprints can cause coating failures because even the smallest amount of oil present on the hand is enough to prevent a bond of the coating to the substrate. Prepared surfaces shall be handled with clean gloves or rags. A good clean surface preparation should accomplish two things:

a. Remove all corrosion products and contaminants so that the coating can be applied on bare, clean metal.

b. Provide a roughened surface, often called an anchor pattern, for a good mechanical bond between the coating and the metal. By far, the best means of obtaining such a surface is by abrasive (grit) blasting.

5. Preparation for Blast. All oil and grease contamination must be removed prior to the commencement of blasting. Chemically clean parts using trichlorethane, Type I, O-T-620C.

6. Depending upon the type of abrasive blaster used, the blast material may be discarded after use or reclaimed. Blasting materials which have been used to remove scale shall not be used for the final blast. The reclamation process consists of cleaning and sifting the usable grit from the scale, dirt and damaged grit. NEVER REUSE GRIT WHICH HAS BEEN USED TO BLAST A VERY GREASY SURFACE. The contamination introduced in either case can be very detrimental to the coating applied over the blasted surface.

7. Material. Angular chilled iron grit or aluminum oxide grit may be used in force-feed, pressure-type blast machines.

8. Condition of Grit. The angular chilled iron grit will be clean and reasonably sharp. Old grit which is rusty, noticeably worn or dull when compared with new grit shall not be used. Grit having a mesh size of S.A.E. G-25 to G-40 shall be used. An individual size or a mixture may be used. The aluminum oxide grit shall be clean, sharp and free of excessive fines and shall have a mesh size of 20 to 50.

9. Blasting Equipment. The blasting equipment used shall be of the conventional force-feed pressure type. Nozzle size shall be such that a pressure of not less than 75 PSI (5.27 kgf/sq. cm) is maintained at the blast generator.

10. Surface Blasting. All surfaces to be flame sprayed shall be thoroughly cleaned and roughened by blasting with an abrasive described in paragraph 8. If paint, oil or bituminous materials are present, they must be removed by flame cleaning or by blast cleaning prior to the final blast operation. The abrasive used for cleaning heavily contaminated surfaces shall not be reused for the final blast, even though the abrasive is rescreened. The abrasive shall be checked periodically to see that it conforms to the requirements of paragraph 8.

11. Air Supply. The air supply must be sufficiently free of oil and moisture so that no visible oil or moisture appears on the blasted surface. The air supply must be adequate to maintain 75 PSI (5.27 kgf/sq. cm) minimum at the blast generator for the abrasives described above.

12. Blasted Surface Inspection. The blasted surfaces shall be inspected and approved as suitable for flame spraying before moving or dismantling the blast equipment. A sample steel plate shall be blasted until the surface cannot be further cleaned or roughened. This should be used for comparison, and any areas which do not compare favorably with the plate as to roughness or cleanliness should be reblasted.

13. Spraying Material. The wire shall be 1/8" (3.2 mm) or 3/16" (4.8 mm) diameter, METCO Aluminum, 99.0% purity.

14. Equipment. Any METCO wire-type flame spray gun shall be used. Use parameters shown in Appendix 1 for use with the 10E wire gun (METCO).

15. Type of Air. Clean, dry air shall be used with not less than 65 PSI air pressure. There shall not be more than 35 feet (11mm) of 3/8" ID (9.5 mm) hose between the Air Control Unit and the gun.

16. Surface Moisture. Any surface which shows visible moisture, rust, scale or other contamination shall be reblasted before spraying. The surface must be completely coated to the specified thickness within two hours of blasting. Preheat valve body to approximately 200°F. to remove moisture and control thermal expansion of body when spraying.

17. Coating Thickness. The metal coating shall be applied to a minimum thickness of .0045" (.11 mm) and a maximum thickness of .008".

18. Number of Applications. The specified thickness of coating shall be applied in multiple layers, and in no case, shall less than two passes of the flame spray gun be made over every part of the surface. The sprayed metal shall overlap on each pass of the gun to assure uniform coverage.

19. Surface After Spraying. The coating shall be firmly adherent. The surface after spraying shall be uniform and free of lumps, loosely adherent spattered metal and uncoated spots.

20. Inspection of Metal Coating. The metal coating shall be inspected for thickness by means of an approved Magnetic Thickness Gage (METCO Elecometer or equal). Inspection shall follow as closely as possible after the completion of spraying. Six as-sprayed thickness measurements and six as-sealed thickness measurements shall be taken and recorded as shown in Appendix 2.

21. Rejected Articles. Articles which have been rejected shall have the defective sections blasted clean of all sprayed metal prior to respraying.

22. Records. A Process Operation Sheet (Appendix 2) shall be completed for each valve body, and the original retained by the ship.

23. Finish Coating Material. The finish coating shall be METCOSEAL SA Silicone Aluminum sealer, thinned with one part METCOSEAL ST-1 Thinner to three parts sealer for spray application, or used directly from the container for brush application. Finish coatings must be applied to clean, dry flame-sprayed surfaces. Any oil, grease or other contamination should be removed by thorough washing with METCOSEAL ST Thinner until no visible traces exist. The surfaces should be allowed to dry for at least 15 minutes before applying METCOSEAL. Coatings must be applied heavily enough to produce a thoroughly wet appearance. These coatings may be applied by brush or spray.

First Coat. The first coat shall be METCOSEAL SA mixed as directed on container. Minimum drying time shall be 30 minutes.

Second Coat. The second coat shall be METCOSEAL SA mixed as directed on container. Minimum drying time shall be at least two hours before placing parts in service.

24. Quality Control. Metallizing operators shall be qualified by successfully metallizing five tensile specimens and one bend/micro/visual specimen. In-process quality will be monitored by requiring each operator to successfully spray at least one bend/micro/visual specimen during each shift of production spraying.

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Prepared By 3/21/78

Approved By: Frank B. Gatto
for Head, Welding Engineering Div.

Encl 1

APPENDIX 1 TO WELDING PROCEDURE #0159

WIRE SPRAY PROCESS	BOND COAT	FINISH COAT
BASE MATERIAL - TYPE/GRADE	CFe/CrMo	
PREPARATION METHOD	CHEMICALLY CLEAN & GRIT BLAST	
GRIT TYPE AND SIZE	CHILLED IRON G-25 to G-50 / ALUM OXIDE 20 to 30	
BLAST NOZZLE TO WORK DISTANCE	4" to 6"	
BLAST NOZZLE TO WORK ANGLE	90°	
GUN TYPE/MODEL	METCO 10E	
NOZZLE TYPE AND SIZE	3/16"	
FUEL GAS	ACETYLENE	
AIR CAP TYPE	EA	
FUEL GAS REGULATOR PSI	LIGHTING 15	
OXYGEN REGULATOR PSI	LIGHTING 40	
AIR REGULATOR PSI	72	
FUEL GAS FLOWMETER CFH	48	
OXYGEN FLOWMETER CFH	48	
AIR FLOWMETER CFH	36	
WIRE TIP LENGTH - INCHES		
WIRE SIZE/TYPE	ALUMINUM 3/16"	
COATING TYPE	ALUMINUM 99% PURITY	
GUN TO WORK DISTANCE	8"	
GUN ANGLE	90°	
PREHEAT TEMPERATURE °F	200	
MAX. TEMPERATURE OF PART °F	400	
ROTATION SPEED OF PART RPM	VARIOUS	
SURFACE SPEED OF PART FPM	30-40	
TRAVERSE RATE INCHES/SECOND	1-2	

FUSING PARAMETERS	BOND COAT	FINISH COAT
FUEL GAS PSI		
OXYGEN PSI		
TORCH TIP TYPE		
TORCH TIP SIZE		
FLAME TYPE REDUCING/NEAUTRAL		
SURFACE SPEED OF PART FPM		
SEALING		
TYPE OF SEALING MATERIAL USED		
MACHINING		
TYPE OF FINISH MACHINE		

FINAL MACHINING SHALL BE ACCOMPLISHED PER APPROVED TECHNIQUES FOR MACHINING THERMAL SPRAYED COATINGS

NOTES: 1. FUEL & OXYGEN PRESSURES ARE FOR LIGHTING ONLY. AFTER THE GUN IS LIGHTED AND SPRAYING, ADJUST TO OBTAIN THE FLOWS LISTED FOR THE FLOWMETERS. IF FINAL PRESSURE IS ABOVE OR BELOW LIGHTING PRESSURE BY MORE THAN 5 PSI AT THE FUEL GAS OR OXYGEN REGULATOR, SHUT DOWN AND LOOK FOR TROUBLE.

2. USE METCO SPRAYING TABLE & NOTES FOR FURTHER INFORMATION.

Encl 1

APPENDIX 1 TO WELDING ENGINEERING PROCEDURE #0159

THE PARAMETERS LISTED IN THIS APPENDIX SHALL BE FOLLOWED EXACTLY TO PRODUCE SATISFACTORY COATINGS FOR THE FOLLOWING USE:

POWDER FLAME SPRAY PROCESS	BOND COAT	FINISH COAT
BASE MATERIAL - TYPE/GRADE		
PREPARATION METHOD		
GRIT TYPE AND SIZE		
BLAST NOZZLE TO WORK DISTANCE		
BLAST NOZZLE TO WORK ANGLE		
GUN TYPE/MODEL		
NOZZLE TYPE		
FUEL GAS TYPE		
METERING VALVE SIZE		
VIBRATOR - OFF/ON		
FUEL GAS PSI		
OXYGEN PSI		
AIR PSI		
FUEL GAS FLOWMETER CFH		
OXYGEN FLOWMETER CFH		
PS AIR, JET CONVERGENCE, INCHES		
PS AIR JET PRESSURE		
FLOWMETER CONTROL VALVE SETTING		
COATING TYPE		
GUN TO WORK DISTANCE		
GUN ANGLE		
PREHEAT TEMPERATURE °F		
ROTATION SPEED OF PART RPM		
SURFACE SPEED OF PART FPM		
TRAVERSE RATE INCHES/SECOND		

PLASMA FLAME SPRAY PROCESS	BOND COAT	FINISH COAT
BASE MATERIAL - TYPE/GRADE		
PREPARATION METHOD		
GRIT TYPE AND SIZE		
BLAST NOZZLE TO WORK DISTANCE		
BLAST NOZZLE TO WORK ANGLE		
GUN TYPE/MODEL		
NOZZLE TYPE AND SIZE - ANODE		
NOZZLE TYPE AND SIZE - CATHODE		
PRIMARY GAS TYPE		
SECONDARY GAS TYPE - CARRIER GAS		
POWDER PORT - YES/NO		
POWDER ADAPTER - YES/NO		
PRIMARY GAS PSI		
SECONDARY GAS PSI		
PRIMARY CONSOLE GAGE PSI		
SECONDARY CONSOLE GAGE PSI		
PRIMARY CONSOLE FLOW CFH		
SECONDARY CONSOLE FLOW CFH		
OPEN CIRCUIT VOLTAGE DC		
OPERATING VOLTAGE DC		
AMPERES DC		
KILOWATTS		
POWDER CONTROL SETTING		
POWDER FEEDER TYPE		
POWDER CARRIER GAS TYPE		
POWDER REGULATOR PSI		
POWDER CONSOLE PSI		
CARRIER GAS FLOW CFH		
RANGE SWITCH HI/LOW		
ORIFICE SIZE		
METER WHEEL TYPE		
FEED RATE METER READING		
METER WHEEL RPM		
VERNIER DIAL SETTING		
FEEDER HOSE-TO-GUN		
POWDER INJECTION PORT - FRONT		
POWDER INJECTION PORT - REAR		
GUN TO WORK DISTANCE		
GUN ANGLE		
PREHEAT TEMPERATURE °F		
POWDER TYPE		
ROTATION SPEED OF PART RPM		
SURFACE SPEED OF PART FPM		
TRAVERSE RATE INCHES/SECOND		

Encl 1

APPENDIX 1 TO WELDING PROCEDURE #0159

WIRE SPRAY PROCESS	BOND COAT	FINISH COAT
BASE MATERIAL - TYPE/GRADE	CrC/CrMo	
PREPARATION METHOD	CHEMICALLY CLEAN & GRIT BLAST	
GRIT TYPE AND SIZE — CHILLED IRON	G-25 to G-50	
GRIT TYPE AND SIZE — ALUM OXIDE	20 to 50	
BLAST NOZZLE TO WORK DISTANCE	4" to 6"	
BLAST NOZZLE TO WORK ANGLE	90°	
GUN TYPE/MODEL	METCO 10E	
NOZZLE TYPE AND SIZE	7A 1/8"	
FUEL GAS	ACETYLENE	
AIR CAP TYPE	EC	
FUEL GAS REGULATOR PSI	15	
OXYGEN REGULATOR PSI	40	
AIR REGULATOR PSI	72	
FUEL GAS FLOWMETER CFH	40	
OXYGEN FLOWMETER CFH	44	
AIR FLOWMETER CFH	36	
WIRE TIP LENGTH - INCHES	0	
WIRE SIZE	1/8"	
COATING TYPE	ALUMINUM 99% PURITY	
GUN TO WORK DISTANCE	8"	
GUN ANGLE	90°	
PREHEAT TEMPERATURE °F	200°	
MAX. TEMPERATURE OF PART °F	400°	
ROTATION SPEED OF PART RPM	VARIOUS	
SURFACE SPEED OF PART FPM	30 - 40	
TRAVERSE RATE INCHES/SECOND	1 - 2	

NOTES: 1. FUEL & OXYGEN PRESSURES ARE FOR LIGHTING ONLY. AFTER THE GUN IS LIGHTED AND SPRAYING, ADJUST TO OBTAIN THE FLOWS LISTED FOR THE FLOW METERS. IF FINAL PRESSURE IS ABOVE OR BELOW LIGHTING PRESSURE BY MORE THAN 5 PSI AT THE FUEL GAS OR OXYGEN REGULATOR, SHUT DOWN AND LOOK FOR TROUBLE.

2. USE METCO SPRAYING TABLE & NOTES FOR FURTHER INFORMATION

FUSING PARAMETERS	BOND COAT	FINISH COAT
FUEL GAS PSI		
OXYGEN PSI		
TORCH TIP TYPE		
TORCH TIP SIZE		
FLAME TYPE REDUCING/NEAUTRAL		
SURFACE SPEED OF PART FPM		

SEALING		
TYPE OF SEALING MATERIAL USED		
METCOSEAL SA		

MACHINING		
TYPE OF FINISH MACHINE		

FINAL MACHINING SHALL BE ACCOMPLISHED PER APPROVED TECHNIQUES FOR MACHINING THERMAL SPRAYED COATINGS

Encl 1

APPENDIX 1 TO *WELDING PROCEDURE #0159*

THE PARAMETERS LISTED IN THIS APPENDIX SHALL BE FOLLOWED EXACTLY TO PRODUCE SATISFACTORY COATINGS FOR THE FOLLOWING USE:

POWDER FLAME SPRAY PROCESS	BOND COAT	FINISH COAT
BASE MATERIAL - TYPE/GRADE		
PREPARATION METHOD		
GRIT TYPE AND SIZE		
BLAST NOZZLE TO WORK DISTANCE		
BLAST NOZZLE TO WORK ANGLE		
GUN TYPE/MODEL		
NOZZLE TYPE		
FUEL GAS TYPE		
METERING VALVE SIZE		
VIBRATOR - OFF/ON		
FUEL GAS PSI		
OXYGEN PSI		
AIR PSI		
FUEL GAS FLOWMETER CFH		
OXYGEN FLOWMETER CFH		
PS AIR, JET CONVERGENCE, INCHES		
PS AIR JET PRESSURE		
FLOWMETER CONTROL VALVE SETTING		
COATING TYPE		
GUN TO WORK DISTANCE		
GUN ANGLE		
PREHEAT TEMPERATURE °F		
ROTATION SPEED OF PART RPM		
SURFACE SPEED OF PART FPM		
TRAVERSE RATE INCHES/SECOND		

PLASMA FLAME SPRAY PROCESS	BOND COAT	FINISH COAT
BASE MATERIAL - TYPE/GRADE		
PREPARATION METHOD		
GRIT TYPE AND SIZE		
BLAST NOZZLE TO WORK DISTANCE		
BLAST NOZZLE TO WORK ANGLE		
GUN TYPE/MODEL		
NOZZLE TYPE AND SIZE - ANODE		
NOZZLE TYPE AND SIZE - CATHODE		
PRIMARY GAS TYPE		
SECONDARY GAS TYPE - CARRIER GAS		
POWDER PORT - YES/NO		
POWDER ADAPTER - YES/NO		
PRIMARY GAS PSI		
SECONDARY GAS PSI		
PRIMARY CONSOLE GAGE PSI		
SECONDARY CONSOLE GAGE PSI		
PRIMARY CONSOLE FLOW CFH		
SECONDARY CONSOLE FLOW CFH		
OPEN CIRCUIT VOLTAGE DC		
OPERATING VOLTAGE DC		
AMPERES DC		
KILOWATTS		
POWDER CONTROL SETTING		
POWDER FEEDER TYPE		
POWDER CARRIER GAS TYPE		
POWDER REGULATOR PSI		
POWDER CONSOLE PSI		
CARRIER GAS FLOW CFH		
RANGE SWITCH HI/LOW		
ORIFICE SIZE		
METER WHEEL TYPE		
FEED RATE METER READING		
METER WHEEL RPM		
VERNIER DIAL SETTING		
FEEDER HOSE-TO-GUN		
POWDER INJECTION PORT - FRONT		
POWDER INJECTION PORT - REAR		
GUN TO WORK DISTANCE		
GUN ANGLE		
PREHEAT TEMPERATURE °F		
POWDER TYPE		
ROTATION SPEED OF PART RPM		
SURFACE SPEED OF PART FPM		
TRAVERSE RATE INCHES/SECOND		

Encl 1

ADDENDUM TO WELDING PROCEDURE 0159

PURPOSE

To specify quality control requirements for metallizing of steam system valves.

SCOPE

This addendum applies to metallizing of ship steam valves accomplished under NAVSHIPYDPUGET Welding Procedure 0159.

REQUIREMENTS

A. Visual Inspection.

1. Prior to abrasive blasting each valve shall be visually inspected to assure removal of grease and oil contaminants.

2. Each valve shall be thoroughly inspected for compliance to surface cleanliness and roughness standards prior to metallizing.

3. Each valve shall be inspected after metallizing to assure coated surface is uniform and free of lumps or uncoated areas.

4. The metallize coating shall be measured to verify that a minimum thickness of .0045 in. (.11 mm) has been attained.

B. Testing. Bend/micro/visual testing shall be conducted on one test specimen from each metallizing operator per shift. Steel plates 1-1/2 x 3 inches, of approximately .050 inch thickness, shall be metallized and serve as the test specimen.

C. Marking. Each valve shall be marked as follows to provide unique traceability to process/inspection documentation:

1. Letter "S" followed by the last three digits of the valve's Material Delivery Record (MDR) (Form 13ND PSNS 4840/1) serial number. These markings shall be followed by the letters "PS" and a number indicating the chronological order the valve was processed. For example, the eighth valve processed for a lot having MDR number 56-300804 would be marked S 804 PS8.

2. Marking shall be applied by die stamping with round-bottom, low stress die stamps. Depth of the impression shall not exceed 0.010 inch. The marking shall be applied to both flanges at the intersection of bonnet to body on the flow arrow side of the valve. These markings shall be clearly visible after metallizing.

D. Material Control.

1. Valves shall be traceable to their applicable MDR's throughout processing. Base material of new valves shall be identifiable through re-application of original color code markings after metallization.

2. Grit blast material shall be periodically inspected for useability.

E. Operator Qualifications. Prior to commencement of production flame spraying, each metallizing operator shall be qualified by successfully flame spraying five tensile and one bend test specimen. Each operator shall maintain qualifications by successfully flame spraying one bend test specimen per shift.

PROCEDURES

1. Production Department

1.1 Shop 31

1.1.1 Assign a number and mark each valve in accordance with Section C. of Requirements prior to valve cleaning and blasting.

1.1.2 Maintain a log by assigned valve number which provides a description of each valve, including the valve's MDR number. For new valves, the log shall include the valve base material and color coding. Request Shop 26 to pick up valves for delivery to Shop 71.

1.1.3 Upon completion of metallizing, refurbish valves as required. Assure all new valves have been color coded to match their original color code marking. Forward valves with applicable Wire Spray Process Operation Sheets (13ND PSNS 9074/1) to Shops 38, 56 or ships force as applicable for installation.

1.2 Shop 72

1.2.1 Prior to initial valve blasting, and weekly thereafter during production, forward a sample of the abrasive grit to Code 134.1 for sieve analysis. Request the analysis via NDT Request (Form 13ND PSNS 4730/26). Scrap all abrasive grit which fails this analysis.

1.2.2 Assure all incoming valves have been stamped with an assigned valve number. Log in each valve by valve number and MDR number. For color coded new valves, identify color code in log book.

1.2.3 Prior to abrasive blasting, visually inspect each valve to assure removal of grease and oil containments. Clean valves with Trichlorethane, Type I, O-T-620C, as necessary to satisfy the inspection.

1.2.4 Protect all internal openings with rubber plugs or metal cups and mask all threads prior to grit blasting.

1.2.5 Following completion of blasting, handle the valves with clean gloves or rags and place them within a polyethylene bag or covering. Attach a tag indicating valve and MDR number, color code marking on valve at time of receipt if applicable, and time/date blasting was completed. Alert Shop 26 that valves are ready for pick up.

1.2.6 Enter data in applicable blocks of the Wire Spray Process Operation Sheet (13ND PSNS 9074/1). . Provide the records with the valves to Shop 26.

1.3 Shop 26

1.3.1 Initiate and enter applicable data on the Wire Spray Process Operation Sheet (13ND PSNS 9074/1) for each valve. (See enclosure (1) for example). Expedite valves and records to and from Shop 71.

NOTE: Handling of clean valves shall be accomplished with clean gloves or rags.

1.3.2 Inspect blasted surfaces for adequacy of cleanliness and roughness. Certify satisfactory surface preparation on Wire Spray Process Operation Sheet.

NOTE: Have a sample steel plate grit blasted until the surface cannot be further cleaned or roughened. Use this sample as a standard for the surface preparation inspection.

1.3.3 For weld end valves, mask off 1/2-inch on the weld ends of the valve before flame spraying. (This is necessary to allow for NDT of joint weld upon valve installation).

1.3.4 Prior to flame spraying, preheat valves to $175^{o}F \pm 25^{o}$ by use of torch or flame spray gun. Use a pyrometer to measure and control the temperature.

1.3.5 Assure metallizing is accomplished only by qualified operators.

1.3.6 Maintain a log of all valves metallized. The log shall identify each valve by assigned number and MDR number. The log shall include time of abrasive blasting completion, time of metallizing completion and time of completion of each coat of sealer. If the valve was color coded prior to cleaning/blasting (as indicated on the Shop 71 initiated tag accompanying the valve), enter the applicable color coding in the log.

1.3.7 Perform visual inspection of surface condition after flame spraying. Surface shall be free of lumps, spattered metal and uncoated spots. Discrepant areas must be blasted clean of all sprayed metal prior to respraying. Uncoated spots may be sprayed if the surface is completely dry and free of contaimination. Identify repaired areas in the "Remarks" block of the Wire Spray Process Operation Sheet. Assure metal coating was applied within two hours of grit blasting completion. Certify acceptable coating on Wire Spray Process Operation Sheet.

1.3.8 Use Magnetic Thickness Gage (Metco Elcometer or equal) to measure coating thickness. The measurements are to be taken in areas as specified on the back of the Wire Spray Process Operation Sheet. Assure a minimum coating of .0045 in. (.11 mm) is attained. (A coating of .005 in. (.13 mm) is desired, however, coatings exceeding this thickness are acceptable). If coating is below minimum specified, additional sprayed metal may be added if the surface is completely dry and free of contamination. When the coating meets the thickness specification, record the measurements on the Wire Spray Process Operation Sheet.

1.3.9 Assure first coat of aluminum sealer is allowed to dry at least thirty minutes before application of the second coat. Measure and record final finish thickness and certify completion of metallization on the Wire Spray Process Operation Sheet. Spray paint color code new valves (for material identification) to match original color coding if color coding was indicated on Shop 71 initiated tag accompaying each valve. Make a copy of each Wire Spray Process Operation Sheet and retain the copy until ship's departure. Forward valves along with Wire Spray Process Operation Sheet hardcards to Shop 31.

1.4 Shop 38 or 56

1.4.1 Install valves as applicable. If valve is nicked or gouged during transit or installation, brush METCOSEAL SA on the damaged area. METCOSEAL SA shall be mixed as directed on the container.

1.4.2 Enter valve installation location on applicable Wire Spray Process Operation Sheet (13ND PSNS 9074/1). (See enclosure (1) for example). Make and forward a copy of the record to Code 138. Provide Wire Spray Process Operation Sheet hardcard to the Ship's Force.

2. Quality Assurance Office (Codes 134, 136, 138)

2.1 Analytical Chemistry Branch (Code 134.1). Perform sieve analysis of abrasive grit as requested. Acceptable iron grit shall be oil free and have a mesh size of S.A.E. G-25 to G-40. Acceptable aluminum oxide grit shall have a mesh size of 20 to 50 and be free of oil contamination.

2.2 Metallurgy and Material Control Branch (Code 134.6). Perform physical testing of metallized test specimens as requested.

2.3 Welding Engineering Division (Code 138)

2.3.1 Prepare procedures for the qualification of flame spray operators to the requirements of NAVSEA 0919-LP-008-8010.

2.3.2 Perform bend/micro/visual analysis of operator test specimens. Request Code 134.6 assistance as necessary.

2.3.3 Evaluate test specimen results for adequacy of process and operator performance.

2.3.4 Provide technical information to all shops and codes concerned in regard to metallizing operations.

2.3.5 Retain a copy of each completed Wire Spray Process Operation Sheet (13ND PSNS 9074/1) for six years.

D. G. Coglizer 4/20/78

APPROVED: D. G. COGLIZER
Head, Welding Engineering Div.

WIRE SPRAY PROCESS OPERATION SHEET (FRONT)
1340 PSNS 90/4/1 (3-73)

SHOP 26 | SHOP 71 | SHOP 26 | 2/135 | SHOPS 56, 38 SHIPS FORCE

DATE: 3/30/78	LOCATION: SPRAY BOOTH 731		PROCEDURE QUALIFICATION ☐
OPERATOR: JOHN SMITH	PART NAME & NUMBER: COPES VULCAN VALVE 924 PS-3		OPERATOR QUALIFICATION ☐
			PRODUCTION ☒

BASE MATERIAL

TYPE OR GRADE	DESCRIPTION OF PART	APPROX. SIZE OF PART	PRIOR HEAT TREATMENT REQ'D
CrMo F	½" GLOBE VALVE	NA	NO

PREPARATION

DEPTH OF PREPARATION	CLEANING METHOD	THREADED PREP	BLASTED PREP
NA	TRICLOROTHANE DIP	NO	YES
GRIT TYPE	GRIT SIZE	BLAST NOZZLE TO WORK DIST.	BLAST NOZZLE TO WORK ANGLE
ALUM OXIDE	SAE #30	6"	90°

PREPARATION SATISFACTORY (SHOP 26 FOREMAN SIGNATURE): F. Smith 4/1/78 — DATE:

EQUIPMENT

GUN TYPE	NOZZLE TYPE AND SIZE	FUEL GAS	TYPE AIR CAP
METCO 10E	⅛"	ACETYLENE	EA
WIRE STRAIGHTENER:	YES ☒ NO ☐	FILTERED AIR:	YES ☒ NO ☐

PARAMETERS

FUEL GAS REG. PSI	OXYGEN REG. PSI	AIR REG. PSI	FUEL GAS FLOWMETER CFH
15	40	72	48
OXYGEN FLOWMETER CFH	AIR FLOWMETER CFH	WIRE TIP LENGTH	WIRE SIZE
73	36	0	⅛

COATING DATA

BOND COAT	FINISH COAT	GUN TO WORK DISTANCE	GUN ANGLE
ALUM 99%	NA	5	90°
PREHEAT TEMP. °F.	ROTATION SPEED OF PART (RPM)	SURFACE SPEED OF PART (FEET/MIN.)	TRAVERSE RATE (INCHES/SEC.)
200	NA	NA	3
TOTAL NO. OF SPRAY AND COOL CYCLES	SPRAY TIME PER CYCLE		COOLING TIME PER CYCLE
NONE	NA		NA
METHOD OF COOLING: AIR ☒ GAS ☐ FORCED ☐ STILL ☒	AS-SPRAYED THICKNESS		AS-FINISHED COATING THICKNESS
	SEE BACK		NA

COATING VISUALLY SATISFACTORY (SHOP 26 FOREMAN SIGNATURE): F. Smith 4/1/78 — DATE:

TESTING DATA

BOND SPECIMEN MATERIAL	BEND/MICRO/HARDNESS PANEL MATERIAL	BOND STRENGTH PSI
MICRO RESULT	BEND RESULT	HARDNESS

FOR TEST SPECIMEN DATA ONLY

COMPONENT INSTALLATION: SHIP NO.	CRANE NO.	BUILDING NO.	OTHER
STANDLEY CG 32			

COMPONENT THAT SPRAYED PART IS ASSEMBLED IN: MAIN STEAM HP DRAIN

AREA OF INSTALLATION - COMPARTMENT/SPACE/FRAME #/PORT-STBD/DISTANCE FROM ℄: ENG RM #1, FR 56, PORT, LOWER LEVEL, 15' FROM ℄

PERSON TO CONTACT FOR PERFORMANCE DATA ON SPRAYED PART: SHIP ENGINEERING OFFICER

ACCELERATED USE TEST: NA

- OPERATING MEDIUM
- PACKING TYPE
- HOURS ROTATING
- HOURS CYCLING
- INSPECTION RESULT

Addendum to Weld Proc. #0189
Enclosure (1)
Sheet 1 of 2

SHIPS FORCE

SHOP 26

W.. SE.. SNY ... ...TION ...LT (...K)
...D ...S ...7/1 (3-73)

MACHINING DATA

PART PREPARATION

MACHINIST NAME: BADGE: SHOP:

FINISH MACHINING

MACHINIST NAME: BADGE: SHOP:

TOOLING USED:

N/A

FINAL INSPECTION RESULT:

FINISH ______ BOND ______ DIMENSIONS ______

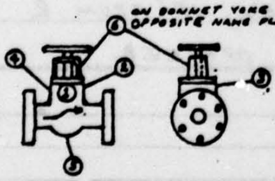
ADDITIONAL INFORMATION OR REMARKS:

1 MINOR AREA APPROX ½" X 1" DID NOT ADHERE PROPERLY UPON VISUAL INSPECTION. AREA LOCATED ON BONNET YOKE NEAR NAMEPLATE. REBLASTED & RESPRAYED UUSAT AREA.

EXAMPLE

IN SERVICE DATE ______

TYPICAL VALVE CONFIGURATION AND SPECIFIC LOCATIONS FOR COATING THICKNESS MEASUREMENTS



ELCOMETER THICKNESS MEASUREMENTS												
LOCATION	AS SPRAYED	AS SEALED	SERVICE TIME									
			6 mo	1 yr	1½ yr	2 yr	2½ yr	3 yr	3½ yr	4 yr	4½ yr	5 yr
1	.008	.010										
2	.010	.012										
3	.006	.009										
4	.005	.008										
5	.011	.013										
6	.009	.012										

SPRAYED PER APPENDIX 1 OF WELDING PROCEDURE #0159

COMPLETION VERIFICATION OF OPERATION SHEET - SHOP 26 FOREMAN (signature/date)

F. Smith 4/1/78

~~Addendum to Weld Proc. #0159~~
Enclosure (1)
Sheet 2 of 2

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VALVES	RECIEVED	MATERIAL	LEVEL	CLEANED TIME DATE	GRIT BLASTED	VALVE	TIME	DATE
S403 PS1		CEE		14:30 3-29	13:30 3-31	PS1	14:30	3-31
S404 PS2		CEE		14:30 3-29	0800 3-30	PS2	9:15	3-30
S405 PS3		CEE		1300 3-30	0800 3-30	PS3	9:30	3-30
S405 PS4		CEE		1300 3-30	13:30 3-31	PS4	14:15	3-30
S406 PS5		CEE		1300 3-30	13:30 3-31	PS5	14:50	3-31
S407 PS6		CEE		1300 3-30	09:30 4-3	PS6	10:30	4-3
S616 PS7		CEE		1300 3-30	09:30 4-3	PS7	10:45	4-3
S408 PS8		CEE		1300 3-30	09:30 4-3	PS8	18:45	4-3
S409 PS9		CEE		1300 3-30	13:30 3-31	PS9	14:45	3-31
S410 PS10		CEE		1300 3-30	1400 3-30	PS10	1430	3-30
S411 PS11		CEE		1300 3-30	1400 3-30	PS11	14:45	3-30
S412 PS12		CEE		1300 3-30	1400 3-30	PS12	1500	3-30
S903-21P	S16	COMO		0900 4-2	11:30 4-3	PS16	1245	4-3
S903-8P	S24	COMO		0900 4-2	11:30 4-3	PS24	1245	4-3
S903-14P	S26	COMO	Reject	1500 4/4	21:00 4/4	PS26	22:00	4/4
S903-20P	S21	COMO		0900 4-2	11:30 4-3	PS21	12:45	4/3
S903-10P	S18	COMO	~~Re~~	0900 4-2	1500 4-3	PS18	1515	4/3
S903-1P	S13	COMO		1500 4/4	21:00 4/4	PS13	22:00	4/4
S903-24P	S22	COMO	Reject	0900 4-2	1500 4/4	PS22	15:30	4/4
S903-26	PS17	COMO	Reject	1500 4/4	21:00 4/4	PS17	22:00	4/4
S903-23	PS25	COMO		0900 4-2	11:30 4/3	PS25	12:45	4/3
S903-2	PS21	COMO		0900 4-2	21:00 4/3	PS21	23:00	4/3
S903-7P	S14	COMO	Reject	1500 4/4	17:40 4/4	PS14	1900	4/4
S903-9P	S27	COMO	CRACKED SENT TO SHOP 54	~~1500 4/4~~	~~19:15 4/4~~	~~PS 27~~	~~19:45~~	~~4/4~~
S903-6	PS23	COMO		0900 4-2	1500 4/3	PS23	15:15	4/3
S903-22	PS15	COMO		0900 4-2	2100 4/3	PS15	2300	4/3
S903-4P	S28	COMO		0900 4-2	1500 4/3	PS28	1500	4/3
S903-25	PS19	COMO		0900 4-2	2215 4/3	PS19	2300	4/3
S903-16	PS38	COMO	Reject	1500 4/4	17:40 4/4	PS38	1900	4/4
S903-15	PS43	COMO		1400 4/2	1245 4/3	PS43	1900	4/3
S903-21	PS44	COMO	Reject	1400 4/2	1400 4/4	PS44	14:30	4/4
S903-5	PS40	COMO	Reject	1500 4/4	17:15 4/4	PS40	19:45	4/4
S903-17	PS45	COMO		1400 4/2	17:15 4/3	PS45	1900	4/3
S903 PS	30	COMO	Reject	1400 4/2	1500 4/4	PS30	1530	4/4
S903-11	PS37	COMO		1400 4/2	17:15 4/3	PS37	1900	4/3
S903-13	PS46	COMO	Reject	1400 4/2	1400 4/4	PS46	1500	4/4
S903-3	PS36	COMO	Reject	1500 4/4	21:00 4/4	PS36	22:00	4/4
S903-2	PS42	COMO	Reject	1500 4/4	21:00 4/4	PS42	22:00	4/4
S903-28	PS41	COMO	Reject	1500 4/4	21:00 4/4	PS41	22:00	4/4
S903-27	PS34	COMO	Reject	1500 4/4	19:15 4/4	PS34	19:45	4/4

Encl 2

VALVE	RECIVED	MATERIAL	LEVEL	CLEANED TIME	DATE	GRIT BLAST TIME	DATE	VALVE	SPRAY TIME	DATE
S903-12 PS35		CO19 COMO	Reject	1500	4/4	17:40	4/4	PS 35	19:00	4/4
S903-19 PS29		COMO		1500	4/4	21:00	4/4	PS 29	22:60	4/4
S678-16 PS66		COMO		11:30	4/5	12:30	4/5	PS 66	13:00	4/5
S678-11 PS76		COMO		19:10	4/5	19:10	4/5	PS 76	19:20	4/5
S678-12 PS73		COMO		19:10	4/5	19:10	4/5	PS 73	19:30	4/5
S678-6 PS74		COMO		14:00	4/5	14:30	4/5	PS 74	15:00	4/5
S678-14 PS77		COMO		14:00	4/5	14:30	4/5	PS 77	15:30	4/5
S678-7 PS70		COMO		11:30	4/5	12:30	4/5	PS 70	13:00	4/5
S678-13 PS54		COMO	Reject	11:30	4/5	12:30	4/5	PS 54	13:00	4/5
S678-5 PS72		COMO		11:30	4/5	12:30	4/5	PS 72	13:15	4/5
S678-15 PS65		COMO		12:30	4/5	1300	4/5	PS 65	14:15	4/5
S678-1 PS67		COMO	Reject	1500	4/4	17:40	4/4	PS 67	19:00	4/4
S678-3 PS62		COMO		21:30	4/5	21:30	4/5	PS 62	22:30	4/5
S678-4 PS60		COMO		21:30	4/5	21:30	4/5	PS 60	22:15	4/5
S804-8 PS52		COMO		14:00	4/5	14:30	4/5	PS 52	16:00	4-5
S678-9 PS71		COMO		12:30	4/5	13:30	4/5	PS 71	1400	4/5
S804-1 PS53		COMO		14:00	4/5	14:30	4/5	PS 53	16:00	4/5
S678-2 PS68		COMO		19:10	4/5	19:10	4/5	PS 68	20:00	4/5
S804-5 PS63		COMO		19:10	4/5	19:10	4/5	PS 63	19:40	4/5
S111-3 PS90		CFE COMO		12:30	4/5	13:30	4/5	PS 90	14:15	4/5
S804-2 PS56		COMO		17:30	4/5	17:30	4/5	PS 56	17:45	4/5
S804-6 PS61		COMO		21:30	4/5	21:30	4/5	PS 61	22:00	4/5
S804-9 PS49		COMO		12:30	4/5	13:30	4/5	PS 49	14:30	4/5
S111-4 PS88		COMO		1400	4/5	14:30	4/5	PS-88	15:00	4/5
S456-1 PS51		COMO		19:10	4/5	19:10	4/5	PS 51	19:50	4/5
S456- PS50		COMO		21:30	4/5	21:30	4/5	PS 50	22:45	4/5
S456-3 PS48		COMO		21:30	4/5	21:30	4/5	PS 48	23:15	4/5
S456-2 PS48		COMO		13:30	4/6	14:00	4/6	PS 48	15:00	4/6
S804-3 PS58		COMO		13:30	4/6	14:00	4/6	PS 58	15:00	4/6
S678-69		COMO		12:30	4/5	13:30	4/5	69	14:45	4/5
S678-8 PS79		COMO		13:30	4/6	14:00	4/6	PS 79	15:00	4/6
S678-10 PS57		COMO		13:30	4/5	13:30	4/5	PS 57	14:30	4/5
S804-4 PS65		COMO		17:30	4/5	17:30	4/5	PS 55	19:00	4/5
S111-1 PS75		COMO		21:30	4/5	21:30	4/5	PS 75	23:30	4/5
S111-2 PS89		COMO		17:30	4/5	17:30	4/5	PS 89	1820	4/5
S804-7 PS63		COMO		13:30	4/6	14:00	4/6	PS 63	15:00	4/6
S804- PS59		COMO		13:30	4/6	14:00	4/6	PS 59	15:00	4/6
S111- PS91		COMO		13:30	4/6	14:00	4/6	PS 91	15:00	4/6
S789- PS82		COMO		21:30	4/5	21:30	4/5	PS 82	23:00	4/5
S011-PS78		CCPE		17:30	4/5	17:30	4/5	PS 78	1845	4/5
S901 PS86		CFE		17:30	4/5	17:30	4/5	PS 86	1800	4/5

Encl 2

VALVE NO	RECIEVED	MATERIAL	LEVEL	CLEANED TIME DATE	BLASTED TIME DATE	VALVE	SPRAY TIME & DATE
S567 PS81		CFE		10:30 4-7	10:45 4-7	PS 81	11:15 4-7-78
S999-2 PS84		CFE		17:20 4-6	17:20 4-6	PS 84	18:05 4-6-78
S999-PS80		CFE		17:20 4-6	17:20 4-6	PS 80	18:05 4-6-78
S990-PS87		CFE		10:30 4-7	10:45 4-7	PS 87	11:15 4-7-78
S999-1 PS85		CFE		10:30 4-7	10:45 4-7	PS 85	11:15 4-7-78
S999-3 PS83		CFE		10:30 4-7	10:45 4-7	PS 83	11:15 4-7-78
S244-PS31	Returned long	STEEL	Reject	10:00 4-7	11:30 4-14	PS31	13:00 4-14-78
S359-PS30	Returned long	STEEL	Reject	10:00 4-7	11:30 4-14	PS30	13:00 4-14-78
S358-PS33	long	STEEL		10:00 4-6	[illegible] 4-7	PS 33	12:30 4-7-78
S245-PS32	Returned long	STEEL	Reject	10:10 4-7	1130 4-14	PS32	1300 4-14-78
S986-PS92		STEEL		14:30	14:45 4-7	PS 95	15:00 4-7-78
S5L3 PS95		CRMO		10:30 4-7	10:45 4-7	PS 95	11:15 4-7-78
S923-4 PS118		CRMO		17:20 4-6	17:20 4-6	PS 118	18:05 - 4-6-78
S5L-2 PS93	P	CRMO		17:20 4-6	21:25 4-6	PS 93	21:50 - 4-6-78
S5L PS96	P	CRMO	Seal Bubs Chkd	17:20 4-6	23:00 4-6	(Touched Seat [illegible]) PS 96	23:15 - 4-6-78
~~[illegible]~~		~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	[illegible]	(Seat [illegible]) [illegible]	
S923-3 PS98		CRMO		19:30 4-6	19:30 4-6	PS 98	20:50 4-6-78
S923-5 PS117		CRMO		19:50 4-6	19:50 4-6	PS 117	20:50 - 4-6-78
S923 PS104		CRMO		19:30 4-6	19:30 4-6	PS104	19:45 - 4-6-78
S923-9 PS116		CRMO		17:20 4-6	17:20 4-6	PS 116	18:30 - 4-6-78
S923 PS112		CRMO		17:20 4-6	17:20 4-6	PS 112	19:30 - 4-6-78
S923-8 PS113		CRMO		17:20 4-6	17:20 4-6	PS 113	17:30 - 4-6-78
S923-1 PS110		CRMO		19:30 4-6	19:50 4-6	PS 110	19:50 - 4-6-78
S923-2 PS115		CRMO		17:20 4-6	17:20 4-6	PS 115	18:40 - 4-6-78
S9511 PS103		CRMO		17:20 4-6	21:25 4-6	PS 103	22:00 - 4-6-78
S923-2 PS94		CRMO		17:20 4-6	17:20 4-6	PS-94	[illegible] - 4-6-78
PS100	large	STEEL		14:00 4-10	14:30 4-10	PS-100	15:00 4-10-78
S0031 PS97	large	Steel		14:00 4-7	15:45 4-10	PS-97	17:10 4/10/78
PS[illegible]99	large	steel		14:00 4-10	14:30 4-10	PS 99	15:00 4-10-78
~~S[illegible] PS114~~		Steel	CRACKED				
S4267 8PS101	large	STEEL		14:00 4-9	0935 4/11	PS101	0845 4-11-78
PS107	large	Steel		14:00 4-9	1545 4/10	PS 107	16:30 4-10-78
PS109	large	Steel		1500 4-6	2230 4/7	PS 109	2245 - 4-7-78
PS108	large	STEEL		1400 4-6	22:30 4/7	PS 108	22:00 - 4-7-78
PS106	large	STEEL		0740 4-7	1835 4/11	PS-106	0555 4-11-78
PS105	large	Steel	Reject	1400 4-12	1300 4-13	PS105	1400 4-13-78
S05012 PS130	18:30	CRMO		1400 4-9	18:30 4/10	PS 130	19:00 4-10-78
S05013 PS129	18:50	CRMO		~~18:50~~	18:50 - 4/15	PS 129	18:45 - 4-15-78
S965-21PS35		CRMO		18:30	18:30 4-7	PS 35	18:50 - 4/7/78
S0507 PS127		Steel		14:00	14:15	PS 127	15:00 [illegible]

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VALVE NO.	RECIEVED	MATERIAL	LEVEL	CLEANED TIME	DATE	BLASTED TIME	DATE	VALVE	SPRAY TIME & DATE	
S0503 PS134 ✓	18:30	CRMO		14:00	4-10	18:50 16:30	4/10 4-9	CROMO PS134	18:35	4-10-78
S0502 PS131 ✓	18:50	CRMO		14:00	4-7	18:50	4-7	CROMO	20:00	4/7
S050 PS133 ✓	18:50	Steel	Reject –	14:00	4-10	21:25 18:50	4-10 4-7	CRMO Steel PS133	23:00	4-10
S05027 PS125	18:50	CRMO	Reject –	14:00	4-10	21:25 18:50	4-10 4-7	CRMO PS125	23:20	4-10
S05019 PS119 ✓		CRMO		14:00	4-10	21:25	4-10	CRMO – PS119	21:40	4-10
S050-1 PS121 ✓		CRMO		1400	4-10	21:25	4-10	CRMO PS121	22:30	4-10
S05029 PS12[illegible] ✓	18:50	Steel		1400	4-7	18:50	4-7	Steel	19:45	4/7
S05023 PS12[illegible] ✓	18:30	CRMO	REJECT	1400	4-10	~~14:30~~	~~4-11~~	CROMO PS126	15:00	4-11
S05017 PS12[illegible] ✓	18:50	CRMO		1400	4-7	18:30	4-7	CROM	19:30	4/7
S05023 PS12[illegible]		STEEL		1400	4-10	0835	4-11	PS-120	1015	4-11
S050-3 PS123 ✓		CRMO		1400	4-10	21:25	4-10	CRMO – PS128	22:05	4/10
S050-6 PS132		CRMO		14:00	4-10	14:30	4-10	PS132	15:00	4-10
S05216 PS123 ✓		CRMO		1400	4-10	21:25	4/10	CRMO – PS123	21:20	4-10
2APA-S-PS165	– large	STEEL		1000	4-12	10:30	4-13	PS165	11:00	4-13
2BPA-S-PS164	– large	STEEL		1000	4-12	10:30	4-13	PS164	11:00	4-13
1BSH-S-PS158	– large	STEEL		1000	4-12	10:30	4-13	PS158	11:00	4-13
1APA-S-PS162	– large	STEEL		13:00	4-13	11:30	4-14	PS162	13:00	4-14
~~1B2-S-PS~~		STEEL								
~~1BSH-S-PS~~		STEEL								
1APA-S-PS160	– large	STEEL		13:00	4-13	11:30	4-14	PS160	13:00	4-14
2A2-S-PS159	– large	STEEL		1000	4-12	10:30	4-13	PS159	1100	4-13
2B2-S-PS161	– large	STEEL		1000	4-12	10:30	4-13	PS141	11:00	4-13
2BSH-S-PS138	– large	STEEL		1000	4-12	10:30	4-13	PS136	11:00	4-13
1A1-S-PS139	– large	STEEL		10.00	4-12	10:30	4-13	PS139	1100	4-13
PS102	– large	STEEL		11:00	4-12	13:00	4-13	PS102	1400	4-13
2A1-S-PS140	– large	STEEL		1000	4-12	1000	4-13	PS140	11:00	4-13
1A2-S-PS141	– large	STEEL		1000	4-12	10:00	4-13	PS141	11:00	4-13
1ASH-S-PS143	– large	STEEL		1000	4-12	10.00	4-13	PS-143	11:00	4-13
1B2-S-PS142	– large	STEEL		10.00	4-12	10.00	4-13	PS142	11:00	4-13
1B1-S-PS-163	– large	STEEL		10.00	4-12	10.00	4-13	PS163	1100	4-13
~~S[illegible]3~~		~~[illegible]~~								
S048-10 PS147		CRMO		13:30	4-11	15:30		PS147	16:00	4-12-78
S048-14 PS152		CRMO		13:30	4-11	4-11	15:00	PS152	15:45	4-11-78
S048-11 PS153		CRMO		13:30	4-11	4-11	21:15	PS153	22:00	4-11-78
S975-2 PS144		CRMO		13:30	4-11	4-12	21:30	PS144	23:10	4-12-78
S9662 PS157		CRMO		13:30	4-11	4-11	21:15	PS157	21:50	4-11-78
S930-170		CRMO		13:30	4-11	4-11	21:15	PS170	22:25	4-11-78
S048-1 PS154		CRMO	← Reject	14:00	4-11		20:20	~~PS154~~	20:45	4-12-78
6972 SP111		CRMO		1000	4-26	4-26	13:30	SP111	1845	4-26-78
S050-9 PS156		CRMO		13:30	4-11	4-11	17:30	PS156	17:45	4-11-78
S048-B 146		CRMO		13:30	4-11	4-11	15:00	PS146	16:00	4-11-78

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VALVE NO.		MATERIAL	LEVEL	CLEANING TIME	DATE	BLASTING TIME	DATE	VALVE	SPRAY TIME AND DATE 41̄7
6978 PS137		CFE		1400	4-10	14:30	4-11	PS 137	15:00 4-11
5080.8 PS 155		CRMO		13:30	4-11	4-11	12:00	PS 155	15:15 4-11-78
5050.4 PS136		CRMO		1400	4-11	14:30	4-11	PS 136	1500 4-11
5049.5 PS149		CFE		13:30	4-11	4-11	15:00	PS 149	16:30 4-11-78
5048.2 PS145		CFE	← Reject	1400	4-11		20:20	PS 145	21:00 4-12-78
5964.3 PS166		CRMO		13:30	4-11	4-11	17:30	PS 166	18:30 4-11-78
5048.15 PS148		CRMO		1400	4-10	14:30	4-11	PS148	1500 4-11
5966. PS 169		CRMO		13:30	4-11	4-11	17:30	PS 169	18:30 - 4-11-78
5048.8 PS150		CRMO		13:30	4-11	4-11	21:15	PS 150	21:30 - 4-11-78
5977. PS167		CRMO		13:30	4-11	4-11	21:15	PS 167	22:30 - 4-11-78
5975.1 PS168		CRMO		1400	4-10	4-12	21:20	PS168	22:30 - 4-11-78
5048.9 PS151		CRMO		13:30	4-11	4-11	21:15	PS 151	22:45 - 4-11-78
5980.3 PS174		CRMO		13:30	4-11	4-11	17:30	PS 174	18:00 - 4-11-78
5050.10 PS 175		CRMO	← Reject -	1330	4-11	4-12	15:30	PS 175	17:00 - 4-12-78
5965. PS172		CRMO		13:30	4-11	4-11	12:30	PS172	18:15 - 4-11-78
5966.1 PS176		CRMO		1330	4-11	13:30	4-12	PS-176	14:30 4-12
5048.16 PS185		CRMO		13:30	4-11	18:00	4-12	PS 185	18:10 4-12-78
5966.4 PS178		CRMO		13:30	4-11	4-11	21:15	PS 178	22:40 - 4-11-78
5050.16 PS186		CRMO		13:30	4-11	10:00	4-12-78	PS 186	11:00 4-12-78
5050.11 PS 180		CRMO	← Reject	13:30	4-11	15:30	4-12-78	PS 180	16:55 4-12-78
5969.2 PS 179		CRMO		13:30	4-11	13:30	4-12	PS179	14:30 4-12-78
5965.3 PS 18		CRMO	← Reject	1500	4-12	19:35	4-12	PS 18	19:45 4-12-78
5048.6 PS 182		CRMO		1500	4-12	17:25	4-17	PS 182	18:10 4-12-78
5050.24 PS 191		CRMO	Reject	13:30	4-11	1000	4-12	PS 191	1100 4-12-78
5050.22 PS 183		CRMO		13:30	4-11	4-11	19:20	PS 183	1940 - 4-11-78
5049.1 PS 187		CFE		14:00	4-10	4-12	20:30	PS 187	20:10 - 4-11-78
5050.26 PS 181		CRMO	← Reject	1400	4-12	15:30	4-12	PS 181	16:45 - 4-12-78
5969 PS 173		CRMO		1400	4-12	18:00	4-12	PS 173	18:20 - 4-12-78
5048.4 PS 177		CRMO		13:30	4-11	100	4-12	PS 177	1100 4-12-78
5050.5 PS 184		CRMO		13:30	4-11	1000	4-12	PS-184	11:00 4-12-78
5975. PS 189		CRMO		13:30	4-11	21:20	4-12	PS 189	21:45 - 4-12-78
PT-1P	Pipe	PIPE		13:30	4-11	10:00	4-12	1P	11:00 4-12
PT-2P	Pipe	PIPE		13:30	4-11	10:00	4-12	2P	11:00 4-12
PT-3P	"	PIPE		13:30	4-11	10:00	4-12	3P	11:00 4-12
PT-4P	"	PIPE		13:30	4-11	10:00	4-12	4P	11:00 4-12
PT-5P	"	PIPE		13:30	4-11	10:00	4-12	5P	11:00 4-12
PT-6P	"	PIPE		13:30	4-11	10:00	4-12	6P	11:00 4-12
5969.1 PS201		CRMO		13:30	4-12	18:10	4-12	PS 201	19:10 - 4-12-78
5048.7 PS195		CRMO		13:30	4-11	13:30	4-12	PS 195	14:30 4-12
5965.1 PS 190		CRMO		13:30	4-12	21:30	4-12	PS 190	22:00 - 4-12-78
5048 PS 198		CRMO		13:30	4-12	20:20	4-12	PS 198	21:30 - 4-12-78

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HEAT RESISTANT PAINT SPEC NO. [illegible]-P-24555

Valve No		Material	Level	Cleaning Time & Date	Blasting Time & Date	Valve	Spray Time & Date
5977 PS204		CFE		13:30 4-11	18:30 4-12	PS 204	20:[illegible] 4-12-78
5980.9 PS200		CRMO		13:30 4-11	18:10 4-12	PS 200	18:50 4-12-78
5979 PS202		CFE		13:30 4-11	20:20 4-12	PS 202	20:30 4-12-78
5050.21 PS197		CRMO		13:30 4-11	18:10 4-12	PS197	19:20 4-12-78
5098.12 PS199		CRMO		13:30 4-11	18:00 4-12	PS 199	19:00 4-12-78
5099 PS203		CFE		13:30 4-11	18:00 4-12	PS 203	18:40 4-12-78
5050.14 PS196	[illegible]	CRMO	[illegible]	13:30 4-11	1400 4-18	PS196	1500 4-18-78
5980.1 PS193		CRMO		13:30 4-11	13:30 4-12	PS193	14:30 4-12
5050.15 PS192		CRMO		13:30 4-11	13:30 4-12	PS 192	14:30 4-12
5050.25 PS194		CRMO		13:30 4-11	21:30 4-12	PS 194	22:10 4-12-78
PT-7P	Pipe	PIPE		13:30 4-11	10:00 4-12	7P	11:00 4-12
PT-8P	Pipe	PIPE		13:30 4-11	10:00 4-12	8P	11:00 4-12
PS221	large	STEEL		15:00 4-12	17:00 4-14	PS 221	18:00 4-14
PS222	large	STEEL	Reject	15:00 4-12	18:00 4-14	PS222	17:00 4-14
5022.2 PS206		CRMO		15:00 4-12	19:30 4-17	PS 206	20:30 4-17-78
5022.3 PS216		CRMO	HEAT RESIST	15:00 4-12	17:20 4-13	PS 216	18:00 4-13-78
5029.3 PS208	DOD-P-24555	CRMO	PAINT	15:00 4-12	0700 4-18	PS 208	0800 4-18-78
5022 PS231		CRMO		15:00 4-12	21:00 4-13	PS 231	21:30 4-13-78
5967 PS205		CFE		15:00 4-12	19:30 4-17	PS 205	20:30 4-17-78
50323 PS224		CRMO	HEAT RESIST	15:00 4-12	17:20 4-13	PS 224	17:45 4-13-78
5029.2 PS212	DOD-P-24555	CRMO	PAINT	15:00 4-12	0700 4-18	PS212	0730 4-18-78
5032.14 PS230		CRMO		15:00 4-12	19:20 4-13	PS 230	20:35 4-13-78
50321 PS228		CRMO	HEAT RESIST	15:00 4-12	17:20 4-13	PS 228	17:30 4-13-78
5032.11 PS229	DOD-P-24555	CRMO	PAINT	15:00 4-12	0700 4-18	PS 229	0800 4-18-78
5029 PS214	DOD-P-24555	CRME	PAINT [illegible]	15:00 4-12	0700 4-18 [illegible]	PS 214	0800 4-18-78
5029.1 PS210		CRMO		15:00 4-12	0830 4-21	PS210	0900 4-21-78
50327 PS226		CRMO		15:00 4-12	21:00 4-13	PS 226	22:55 4-13-78
50221 PS225		CRMO		15:00 4-12	17:25 4-17	PS 225	18:00 4-17-78
5022.5 PS215		CRMO		15:00 4-12	20:00 4-13	PS 215	20:15 4-13-78
5032 PS232		CRMO		1500 4-12	20:15 4-17	PS232	4-17-78 21:15
5032.6 PS209		CRMO		15:00 4-12	1500 4-17-78	PS 209	1500 4-17-78
5028 PS207		CRMO		15:00 4-12	21:30 4-17	PS 207	22:05 4-17-78
5980.2 PS171		CRMO		1500 4-12	19:20 4-13	PS 171	2205 4-13-78
5032.2 PS227		CRMO		15:00 4-12	19:30 4-17	PS 227	20:30 4-17-78
5032.16 PS235		CRMO		1500 4-12	14:00 4-17-78	PS 235	1500 4-17-78
5029 PS218	Reject-	CRMO		15:00 4-12	1900 4-17-78	PS 218	1500 4-17-78
5403247 PS211		CRMO		15:00 4-12	1900 4-17-78	PS211	2000 4-17-78
5032 PS213		CRMO		15:00 4-12	19:25 4-17	PS 213	20:00 4-17-78
5032.5 PS233		CRMO		15:00 4-12	21:30 4-17	PS 235	22:00 4-17-78
5025.3 PS220		CRMO		15:00 4-12	21:00 4-13	PS 220	22:40 4-13-78
5028.4 PS217		CRMO		15:00 4-12	19:20 4-13	PS 217	20:30 4-13-78

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Valve No.		Material	Level	Cleaning Time & Date	Blast Time & Date	Valve	Spray Time & Date
S032.6 PS223		CRMO		15:00 4-12	1920 4-13	PS 223	19:50 4-13-78
S03213 PS234		CRMO		1500 4-12	21:30 4-17	PS 234	22:20 4-17-78
S03212 PS237		CRMO		1500 4-12	17:20 4-13	PS 237	18:40 4-13-78
S0382 PS219		CRMO		15:00 4-12	21:30 4-13	PS 219	22:25 4-17-78
S03210 PS236		CRMO		1500 4-12	19:20 4-13	PS 236	20:15 4-13-78
~~PS103~~		~~[illegible]~~		~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
5S? ~~PS236~~	large	STEEL		1500 4-12	19:00 4-14	PS572	4-14-78 20:00
S577 PS239	large	STEEL		1500 4-12	14:00 4-14-78	PS238	17:00 4-14-78
S4032 PS201		CRMO		15:00 4-12	17:20 4-13	PS 201	18:15 4-13-78
S0435 PS241		STEEL		15:00 4-17	19:00 4-17-78	PS 291	1500 4-17-78
S0.13.4 PS242		STEEL		15:00 4-12	17:25 4-17	PS 290	18:25 4-17-78
~~S529 PS221~~		~~Steel~~		~~[illegible] 4-14~~	~~[illegible] 4-14~~	~~PS 221~~	~~17:30 4-14-78~~
~~S541 PS222~~	Reject ([illegible])	~~Steel~~	~~[illegible]~~		~~16:00 4-14~~	~~PS 222~~	~~[illegible]~~
~~S562 PS.592~~		~~Steel~~		~~16:00 4-14~~	~~21:00 4-14~~	~~PS 592~~	~~21:45 4-14-78~~
~~S577 PS239~~		~~Steel~~		~~[illegible] 4-14~~	~~22:45 4-14~~	~~PS 239~~	~~23:00 4-14-78~~
S032 PS 262		CRMO		1300 4-18	19:30 4-17	PS 282	20:45 4-17-78
S465 P242	[illegible]	STEEL		1300 4-18	16:30 4-18	PS 292	17:45 4-18-78
S467 PS213	"	STEEL	Reject	1300 4-18	0700 4-19	PS 243	0800 4-19-78
S458 PS244	"	STEEL		1300 4-18	16:30 4-18	PS 244	17:25 4-18-78
S462 PS245	"	STEEL		1300 4-18	21:30 4-18	PS 245	22:40 4-18-78
S464 PS246	"	STEEL	Reject	1300 4-18	0700 4-19	PS 246	0800 4-19-78
S466 PS247	"	STEEL		1300 4-18	16:50 4-18	PS 247	18:30 4-18-78
S460 PS248	"	STEEL		1300 4-18	17:30 4-18	PS 248	17:16 4-18-78
S457 PS249	"	STEEL		1300 4-18	17:30 4-18	PS 249	18:25 4-18-78
S452 PS250	"	STEEL	Reject	1300 4-18	0700 4-19	PS 250	0800 4-19-78
S461 PS251	"	STEEL		1300 4-18	17:30 4-18	PS 251	16:00 4-18-78
S451 PS252	"	STEEL		1300 4-18	17:30 4-18	PS 252	19:10 4-18-78
S454 PS253	"	STEEL		1300 4-18	21:30 4-18	PS 253	22:20 4-18-78
S456 PS254	DOD-P-24555	STEEL	HEAT RESISTANT PAINT	1300 4-18	21:30 4-18	PS 254	22:50 4-18-78
S455 PS255	"	STEEL		1300 4-18	21:30 4-18	PS 255	21:55 4-18-78
S459 PS256	" DOD-P-24555	STEEL	HEAT RESISTANT PAINT	1300 4-18	21:30 4-18	PS 256	22:10 4-18-78
7-126-2	HATCH COVER	STEEL		N/A	14:00 4-18	7-126-2	1500: 4-18-78
7-127-2	HATCH COVER	STEEL		N/A	14:00 4-18	7-127-7	1500: 4-18-78
PS264	large Valve	STEEL		0900 4-20	12:30 4-20	PS264	13:30 4-20-78
PS263	large Valve	STEEL		0900 4-20	15:30 4-20	PS 265	17:50 4-20-78
PS261	large Valve	STEEL		0900 4-20	1400 4-21	PS261	1500 4-21-78
PS262	large Valve	STEEL		0900 4-20	0900 4-21	PS262	10:00 4-21-78
PS260	large Valve	STEEL		0900 4-20	1400 4-21	PS260	1500 4-21-78
PS259	large Valve	STEEL		0900 4-20	2130 4-20	PS-259	22:10 4-20-78
PS258	large Valve	STEEL		0900 4-20	900 4-21	PS258	1000 4-21-78
PS257	large Valve	STEEL	Reject - Re-blasted	0900 4-20	2345 4-20	PS 327	23:25 4-20-78

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Valve No	Eng Value	Material	Load	Cleaning Time & Date		Blasting Time & Date		Valve No.	Spray Time Date-31
PS265		STEEL		900	4-24				
5946.10 PS272	DOD-P-24555	CFE	HEAT RESIST PAINT	900	4-25	10:00	4-25	PS 272	4-25-78 10:30
5948.19 PS276		CFE		900	4-25	13:00	4-25	PS276	4-25-78 13:30
5948.20 PS275		CFE		900	4-25	13:00	4-25	PS 275	4-25-78 1400
5948.1 PS267		CFE		900	4-25	13:00	4-25	PS267	4-25-78 14:30
5948.5 PS271		CFE		900	4-25	13:00	4-25	PS 271	4-25-78 14:30
5948.13 PS273		CFE		900	4-25	1300	4-25	PS273	4-25-78 13:30
5948.12 PS269	TT-P-28E	CFE	HEAT RESIST PAINT	900	4-25	10:00	4-25	PS 269	4-25-78 10:30
5948.9 PS270	DOD-P-24555	CFE	HEAT RESISTA PAINT	900	4-25	10:00	4-25	PS270	4-25-78 10:30
5948.18 PS266	TT-P-28E	CFE	HEAT REST PAINT	900	4-25	10:00	4-25	PS 266	4-25-78 1030
5948.6 PS268		CFE		900	4-25	0800	4-26	PS269	4-26-78 0900
5948.15 PS278		CFE		900	4-25	10:30	4-26	PS278	4-26-78 11:00
5948.7 PS280		CFE		900	4-25	10:30	4-26	PS280	4-26-78 11:00
5948.2 PS282		CFE		900	4-25	0800	4-26	PS282	4-26-78 0900
5948.3 PS284		CFE		900	4-26	1300	4-27	PS284	4-27-78 1400
5948.15 PS281		CFE		900	4-25	0800	4-26	PS281	2-26-78 0900
5948.8 PS283		CFE		900	4-25	0900	4-26	PS283	4-26-78 0900
5948.21 PS277		CFE	Reject	900	4-25	0800	5-12-78	PS277	5-12-78 0815
5948.19 PS279		CFE		900	4-26	10:30	4-26	PS279	4-26-78 11:00
5948.11 PS274		CFE		900	4-25	10:30	4-26	PS274	4-26-78 11:00
5948.9 PS287		CFE		0900	4-25	10:30	4-26	PS 287	4-26-78 11:00
5948 PS286		CFE		0900	4-25	13:30	4-27	PS286	4-27-78 1400
5948.16 PS285		CFE		0900	4-25	0800	4-26	PS285	4-26-78 0900
5938.13 PS299		CRMO		1000	4-26	13:35	4-26	PS299	4-26-78 14:45
5938.25 PS294		CRMO		1000	4-26	13:30	4-26	PS 294	4-26-78 14:30
5938.29 PS293		CRMO		1000	4-26	13:30	4-26	PS293	4-26-78 14:35
5938.3 PS296		CRMO		1000	4-26	0930	4-27	PS296	4-27-78 10:50
5938.24 PS295		CRMO		1000	4-26	13:30	4-26	PS295	4-26-78 14:30
5938.19 PS291		CRMO		1000	4-26	13:30	4-26	PS291	4-26-78 14:35
5938.— PS297	TT-P-28E	CRMO	HEAT RESIST PAINT	1000	4-26	1300	4-27	PS 297	4-27-78 1400
5938.20 PS288		CRMO		1000	4-26	13:30	4-26	PS288	4-26-78 14:30
5938.1 PS290		CRMO		1000	4-26	13:30	4-26	PS 290	4-26-78 14:30
5938.17 PS292		CRMO		1000	4-26	13:30	4-26	PS292	4-26-78 14:30
5938.2 PS289		CRMO		10:00	4-26	13:30	4-26	PS289	4-26-78 14:35
5938.22 PS300		CRMO		13:30	4-26	09:30	4-27	PS305	4-27-78 11:00
5938.14 PS303		CRMO		13:30	4-26	0715	4-27	PS 303	4-27-78 08:30
5938.23 PS306		CRMO		13:30	4-26	0715	4-27	PS 306	4-27-78 0815
5938.9 PS314		CRMO		13:35	4-26	0715	4-27	PS 314	4-27-78 0852
5938.31 PS301		CRMO		13:30	4-26	0715	4-27	PS 301	4-27-78 0845
5938.12 PS304	TT-P-28E	CRMO	HEAT RESIST PAINT	13:30	4-26	1300	4-27	PS 304	4-27-78 1400

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Valve No.		Material	Level	Cleaning Time & Date		Blasting Time & Date		Valve No.	Spray Time & Date 41
5938.4 PS302		CRMO		13:30	4-26	09:30	4-27	PS302	4-27-78 10:30
5938.27 PS310		CRMO		13:30	4-26	09:30	4-27	PS 310	4-27-78 10:55
5938.6 PS312		CRMO		13:30	4-26	0930	4-27	PS 312	4-27-78 10:30
5938.28 PS315		CRMO		13:30	4-26	0715	4-27	PS 315	4-27-78 [illegible]
5938.10 PS309		CRMO		13:30	4-26	0715	4-27	PS309	4-27-78 [illegible]
5938.7 PS307		CRMO		13:30	4-26	0715	4-27	PS307	4-27-78 0815
5938.5 PS317		CRMO		1300	4-26	0930	4-27	PS317	4-27-78 11:00
5938.6 PS316		CRMO		13:30	4-26	0945	4-27	PS316	4-27-78 10:30
5938.26 PS308		CRMO		13:30	4-26	09:30	4-27	PS 308	4-27-78 10:55
5938.15 PS305		CRMO		13:30	4-26	13:30	4-27	PS305	4-27-78 14:30
5938.30 PS298		CRMO		13:30	4-26	13:30	4-27	PS298	4-27-78 1430
5938.33 PS313	IT-D-29E	CRMO	HEAT RESIST PAINT	1330	4-26	1300	4-27	PS313	4-27-78 1400
5938.32 PS311		CRMO		13:30	4-26	0715	4-27	PS 311	4-27-78 [illegible]
5938.18 PS320		CRMO		10:00	4-27	08:30	4-28	PS320	4-28-78 0920
5938.21 PS318		CRMO		10:00	4-27	13:30	4-28	PS 318	4-28-78 1400
5942.36 PS324		CRMO		10:00	4-27	08:30	4-28	PS 324	4-28-78 10:30
5942.16 PS326		CRMO		10:00	4-27	4-28	0:730	PS 326	4-28-78 0830
5942.49 PS327		CRMO		10:00	4-27	4-28	0:830	PS327	4-28-78 10:00
5942.45 PS322		CRMO		1000	4-27	4-28	0830	PS 322	4-28-78 09:45
5938.4 PS319		CRMO		1000	4-27	0:730	4-28	PS 319	4-28-78 0:850
5942.43 PS325		CRMO		1000	4-27	07:30	4-28	PS 325	4-28 08:30
5938.16 PS321		CRMO		1000	4-27	08:30	4-28	PS 321	4-28 0915
5942.59 PS323		CRMO		1000	4-27	0:830	4-28	PS 323	4-28 0900
5942.39 PS335		CRMO		13:00	4-27	13:30	4-28	PS335	4-28-78 1400
5942.28 PS347		CRMG		1300	4-27	07:30	4-28	PS 347	4-28 08:30
5942.30 PS333		CRMO		13:00	4-27	0:8:30	4-28	PS 333	4-28 09:15
5942.74 PS337		CRMG		1300	4-27	0730	4-28	PS337	4-28-78 0800
5942.35 PS339		CRMC		1300	4-27	08:30	4-28	PS339	4-28-78 09:30
5942.21 PS334		CRMO		1300	4-27	0730	4-28	PS334	4-28-78 0800
5942.53 PS332		CRMO		1300	4-27	13:30	4-28	PS332	4-28-78 1400
5942.11 PS345		CRMO		1300	4-27	07:30	4-28	PS345	4-28-78 08:35
5942.73 PS334		CRMO		1300	4-27	07:30	4-28	PS334	4-28-78 09:30
5942.13 PS336		CRMG		1300	4-27	08:30	4-28	PS 336	4-28-78 0910
5942.18 PS343		CRMG		1300	4-27	0:9:30	4-28	PS343	4-28-78 10:30
5942.32 PS341		CRMG		1300	4-27	0:730	4-28	PS341	4-28-78 08:55
5942.17 PS342		CRMG		1300	4-27	10:30	4-28	PS 342	4-28-78 11:30
5942.33 PS331		CRMO		1300	4-27	10:30	4-28	PS 331	4-28-78 11:00
5942.75 PS348		CRMO		1300	4-27	10:30	4-28	PS 348	4-28-78 11:00
5942.29 PS340		CRMG		1300	4-27	10:30	4-28	PS 340	4-28-78 11:30
5942.46 PS338		CRMO		1300	4-27	13:30	4-28	PS 338	4-28-78 1400
5942.21 PS344		CRMO		13:00	4-27	0:30	4-28	PS 344	4-28-78 09:30

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VALVE NO.		MATERIAL	LEVEL	CLEANING TIME DATE	BLASTING TIME & DATE	VALVE NO.	SPRAY TIME & DATE
5942.69 PS349		CRMO		1000 4-28	07:30 5-1-78	PS349	09:15 5-1-78
5942.25 PS350		CRMO		1000 4-28	13:30 4-28	PS350	14:00 4-28-78
5942.26 PS354		CRMO		1000 4-28	1300 5-1-78	PS354	1400 5-1-78
5942.52 PS353		CRMO		1000 4-28	07:30 5-1-78	PS353	0900 5-1-78
5942.8 PS355		CRMO		1000 4-28	07:30 5-1-78	PS355	0900 5-1-78
5942 PS346		CRMO		1000 4-28	07:30 5-1-78	PS346	0920 5-1-78
5942.23 PS352		CRMO		1000 4-28	07:30 5-1-78	PS352	09:30 5-1-78
5942.9 PS353		CRMO		1000 4-28	07:30 5-1-78	PS353	09:10 5-1-78
5942.69 PS357		CRMO		1000 4-28	13:00 4-28	PS357	1400 4-28-78
5942.41 PS356		CRMO		1000 4-28	07:30 5-1-78	PS356	0900 5-1-78
5942.76 PS351		CRMO		1000 4-28	0730 5-1-78	PS351	0800 5-1-78
5942.10 PS358		CRMO		100 4-28	07:30 5-1-78	PS358	09:15 5-1-78
5942 PS360		CRMO		1430 4-28	1300 5-1-78	PS360	14:30 5-1-78
5942.70 PS359		CRMO		14:30 4-28	11:30 5-2-78	PS359	12:30 5-2-78
5942.37 PS367		CRMO		1430 4-28	07:30 5-2-78	PS367	09:15 5-2-78
5942.66 PS365		CRMO		1430 4-28	13:00 5-1-78	PS365	14:35 5-1-78
5942.2 PS364		CRMO		14:30 4-28	0:730 5-2-78	PS364	08:10 5-2-78
5942.31 PS361		CRMO		14:30 4-28	13:00 5-1-78	PS361	1400 5-1-78
5942.27 PS368		CRMO		14:30 4-28	13:00 5-1-78	PS368	1400 5-1-78
5942.63 PS366		CRMO		14:30 4-28	11:30 5-2-78	PS366	12:30 5-2-78
5942.57 PS363		CRMO		14:30 4-28	13:00 5-1-78	PS363	14:15 5-1-78
5942.47 PS362		CRMO		14:30 4-28	07:30 5-2-78	PS362	09:15 5-2-78
5942.15 PS374		CRMO		08:30 5-1	1300 5-2-78	PS374	1400 5-2-78
5942.67 PS376		CRMO		0830 5-1	1300 5-2-78	PS376	1400 5-2-78
5942.7 PS373		CRMO		08:30 5-1	1000 5-3-78	PS373	11:00 5-3-78
5942.6 PS372		CRMO		08:30 5-1	1300 5-2	PS378	1400 5-2-78
5942.12 PS369		CRMO		08:30 5-1	12:30 5-3-78	PS369	14:30 5-3-78
5942.55 PS370		CRMO		08:30 5-1	1300 5-2	PS370	1400 5-2-78
5942.57 PS371		CRMO		08:30 5-1	13:00 5-4	PS371	1400 5-4-78
5942.60 PS375		CRMO		08:30 5-1	07:30 5-2-78	PS375	0800 5-2-78
557E PS378	Large Valve	CFE		11:00 5-1	1000 5-4-78	PS378	11:00 5-8-78
50026 PS330	Large Valve	CFE		11:00 5-1	0800 5-4-78	PS330	1000 5-4-78
50029 PS329	Large Valve	CFE		11:01 5-1	12:30 5-11-78	PS329	13:30 5-11-78
50030 PS328	Large Valve	CFE		11:00 5-1	12:30 5-11-78	PS328	13:30 5-11-78
5?6E PS385	Large Valve	CFE		11:00 5-1	08:30 5-4-78	PS385	09:30 5-4-78
5EC1 PS384	Large Valve	CFE		11:00 5-1	1600 5-8-78	PS384	17:45 5-8-78
55E6 PS387	Large Valve	CFE		11:00 5-1	0800 5-4-78	PS387	09:30 5-4-78
5595 PS388	Large Valve	CFE		11:00 5-1	1300 5-11-78	PS388	14:30 5-11-78
5595 PS382	Large Valve	CFE		11:00 5-1	0800 5-4-78	PS382	0900 5-4-78
5585 PS390	Large Valve	CFE		11:00 5-1	0800 5-4-78	PS390	900 5-4-78
PS265	Large Valve	CFE		11:00 5-1	01000 5-8-78	PS265	11:00 5-8-78

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Value No		Material	Level	Cleaning time & Date	Blasting Time & Date	Valve No	Spraying Time & Date
5.942.58 PS383		CRMO		13:00 5-1	11:30 5-2-78	PS383	12:30 5-2-78
5942.40 PS381		CRMO		13:00 5-1	11:00 5-2-78	PS381	11:35 – 5-2-78
5942.5 PS380		CRMO	Reject	13:00 5-1	0800 5-4-78	PS380	900 5-4-78
5942.72 PS386		CRMO		13:00 5-1	11:00 5-2-78	PS 386	11:30 5-2-78
5942.46 PS393		CRMO		13:00 5-1	13:30 5-3-78	PS393	14:45 5-3-78
5942.17 PS377		CRMO		13:00 5-1	1300 5-2-78	PS377	1400 5-2-78
5942.15 PS391		CRMO		13:00 5-1	07:30 5-2-78	PS391	0900 5-2-78
5942.2 PS395		CRMO		13:00 5-1	13:30 5-3-78	PS 395	14:45 5-3-78
5942.80 PS389		CRMO		13:00 5-1	07:30 5-2-78	PS389	8:00 5-2-78
5942.24 PS392		CRMO		13:00 5-1	11:00 5-2-78	PS392	11:30 5-2-78
5942.71 PS379		CRMO		13:00 5-1	07:30 5-2-78	PS379	0830 5-2-78
5942.77 PS396		CRMO		13:00 5-1	7:30 5-2-78	PS 396	0817 5-2-78
5942.3 PS394		CRMO		13:00 5-1	13:30 5-3-78	PS 394	14:45 5-3-78
5942.56 PS410		CRMO		0900 5-2	0800 5-3-78	PS410	09:30 5-3-78
5942.42 PS404		CRMO		0900 5-2	0800 5-3-78	PS404	0900 5-3-78
5942.38 PS408		CRMO		0900 5-2	0800 5-3-78	PS408	0900 5-3-78
5942.22 PS403		CRMO		0900 5-2	0800 5-3-78	PS403	0900 5-3-78
5942.1 PS398		CRMO		0900 5-2	0800 5-3-78	PS398	0900 5-3-78
5942.68 PS402		CRMO		0900 5-2	0800 5-3-78	PS402	0900 5-3-78
5942.50 PS404		CRMO		0900 5-2	0800 5-3-78	PS404	09:30 5-3-78
5942.54 PS407		CRMO		0900 5-2	10:00 5-3-78	PS 409	10:35 5-3-78
5942.65 PS397		CRMO		0900 5-2	13:30 5-3-78	PS397	14:45 5-3-78
5942.71 PS406		CRMO		0900 5-2	1000 5-3-78	PS 406	1045 5-3-78
5942.4 PS401		CRMO		0900 5-2	10:30 5-9-78	PS 401	1100 5-9-78
5942.34 PS399		CRMO		0900 5-2	1000 5-3-78	PS399	10:30 5-3-78
5942.78 PS405		CRMO		0900 5-2	0800 5-3-78	PS 405	09:50 5-3-78
5942.49 PS400		CRMO		0900 5-2	0800 5-3-78	PS400	09:45 5-3-78
5948.59 PS417		CRMO		13:00 5-2	0800 5-9-78	PS 417	09:45 5-9-78
5948.54 PS420		CRMO		1300 5-2	09:30 5-9-78	PS 420	1000 5-9-78
5948.42 PS414		CRMO		1300 5-2	1000 5-3-78	PS 414	1100 5-3-78
5948.38 PS415		CRMO		1300 5-2	10:00 5-3-78	PS 415	10:30 5-3-78
5948.56 PS419		CRMO		1300 5-2	0800 5-11-78	PS 419	900 5-11-78
5948.39 PS413		CRMO		1300 5-2	0800 5-9-78	PS 413	[illegible] 5-9-78
5948.22 PS411		CRMO		1300 5-2	0800 5-10-78	PS 411	0810 5-10-78
5948.23 PS416		CRMO		1300 5-2	09:30 5-9-78	PS 416	10:30 5-9-78
5948.40 PS418		CRMO		1300 5-2	0800 5-11-78	PS 418	900 5-11-78
5948.52 PS412		CRMO		1300 5-2	0800 5-9-78	PS 412	0810 5-9-78
5948.33 PS438		CRMO		0900 5-4	1300 5-10-78	PS438	1400 5-10-78
5948.30 PS431		CRMO		0900 5-4	1400 5-9-78	PS431	1500 5-9-78
5948.29 PS443		CRMO		0900 5-4	09:30 5-9-78	PS443	10:30 5-9-78
5948. PS449		CRMO		0900 5-4	1400 5-9-78	PS449	1500 5-9-78

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Valve No.		Material	Level	Cleaning Time + Date		Blasting Time & Date		Valve No.	Spraying Time & Date
S948.37 PS425		CRMO		0900	5-4	0800	5-9-78	PS425	08:35 5-9-78
S948.35 PS447		CRMO		0900	5-4	09:30	5-9-78	PS447	10:30 5-9-78
S948.27 PS421		CRMO		0900	5-4	0800	5-11-78	PS421	900 5-11-78
S948.25 PS441		CRMO		0900	5-4	0800	5-11-78	PS 441	900 5-11-78
S948.28 PS451		CRMO		0900	5-4	0800	5-11-78	PS451	900 5-11-78
S948.57 PS444		CRMO		0900	5-4	1300	5-10-78	PS444	1400 5-10-78
S948.43 PS429		CRMO		0900	5-4	0800	5-10-78	PS429	0850 5-10-78
S948.66 PS434		CRMO		0900	5-4	1300	5-10-78	PS434	1400 5-10-78
S948.50 PS427		CRMO		0900	5-4	0800	5-9-78	PS427	09:30 5-9-78
S948.32 PS439		CRMO		0900	5-4	0800	5-10-78	PS439	0835 5-10-78
S948.63 PS428		CRMO		0900	5-4	0800	5-9-78	PS428	08:30 5-9-78
S948.81 PS450		CRMO		0900	5-4	0800	5-11-78	PS450	09:45 5-11-78
S948.45 PS423		CRMO		0900	5-4	09:30	5-9-78	PS 423	08:30 5-9-78
S948.31 PS435		CRMO		0900	5-4	0800	5-10-78	PS435	0845 5-10-78
S948.61 PS440		CRMO		0900	5-4	1400	5-9-78	PS440	1500 5-9-78
S948.24 PS442		CRMO		0900	5-4	1300	5-10-78	PS442	1400 5-10-78
S948.18 PS437		CRMO		0900	5-4	1400	5-9-78	PS 437	1500 5-9-78
S948.62 PS445		CRMO		0900	5-4	1300	5-10-78	PS 445	1400 5-10-78
S948.26 PS433		CRMO		0900	5-4	0800	5-11-78	PS433	0900 5-11-78
S948.34 PS446		CRMO		0900	5-4	0800	5-9-78	PS446	0900 5-9-78
S948.49 PS432		CRMO		0900	5-4	0800	5-10-78	PS 432	08:30 5-10-78
S948.47 PS452		CRMO		0900	5-4	1400	5-9-78	PS 452	1500 5-9-78
S948.55 PS448		CRMO		0900	5-4	0800	5-10-78	PS448	0815 5-10-78
S948.36 PS430		CRMO		0900	5-4	0800	5-11-78	PS 430	0900 5-11-78
S948.58 PS426		CRMO		0900	5-4	0800	5-10-78	PS426	0900 5-10-78
S948.60 PS424		CRMO		0900	5-4	1400	5-9-78	PS424	15:00 5-9-78
S948.51 PS422		CRMO		0900	5-4	0800	5-10-78	PS 422	0820 5-10-78
S948.44 PS436		CRMO		0900	5-4	1300	5-10-78	PS 436	1400 5-10-78
~~S948~~									
2ASH PS454	Surf Valve	STEEL		11:00	5-11-78	900	5-12-78	PS454	10:00 5-12-78
2ASH PS453	Surf Valve	STEEL		11:00	5-11-78	0900	5-12-78	PS453	10:00 5-12-78

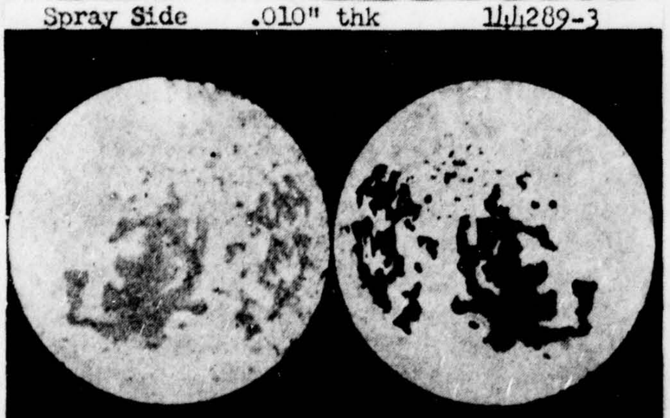
Spray Side .010" thk 144289-1

Failed at epoxy & spray bond 4880 PSI

Spray Side .007" thk 144289-2

Failed at epoxy bond 4630 PSI

Spray Side .010" thk 144289-3



Failed at epoxy & spray bond 5530 PSI

Spray Side .009" thk 144289-4

Failed at spray bond 4430 PSI

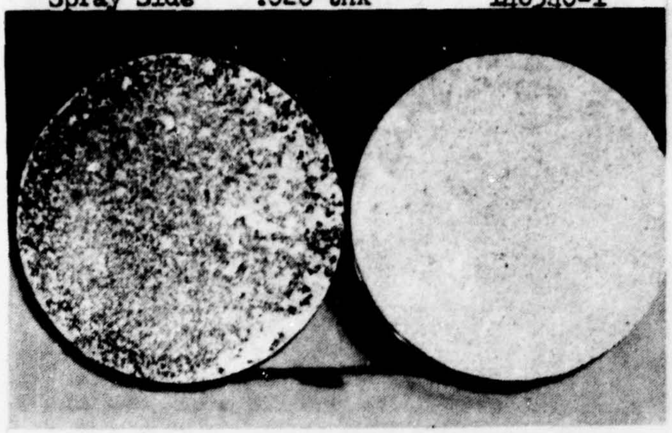
Spray Side .008" thk 144289-5

Failed at spray bond 4950 PSI

Pulled Tensile Specimen Photographs

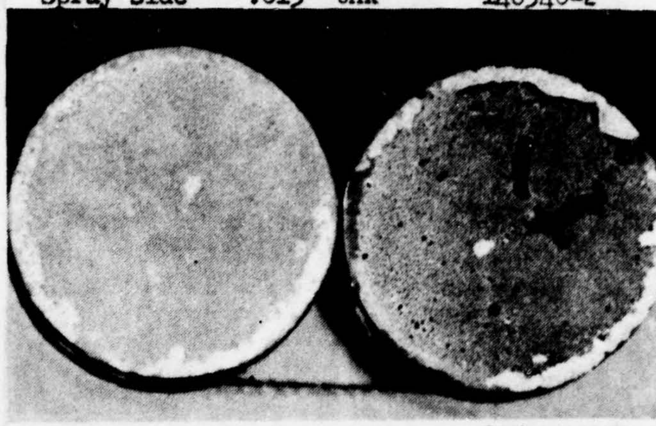
Figure 1

Spray Side .020"thk 148340-1



Failed at spray bond 1600 PSI

Spray Side .015" thk 148340-2



Failed at epoxy bond 8150 PSI

Spray Side .020" thk 148340-3

Failed at spray/epoxy bond 8400 PSI

Spray Side .016" thk 148340-4

Failed at epoxy & spray bond 6500 PSI

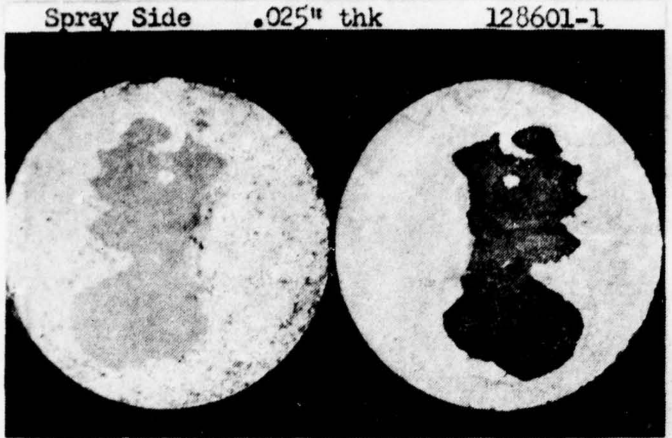
Spray Side .025" thk 148340-5

Failed within spray 6200 PSI

Pulled Tensile Specimen Photographs

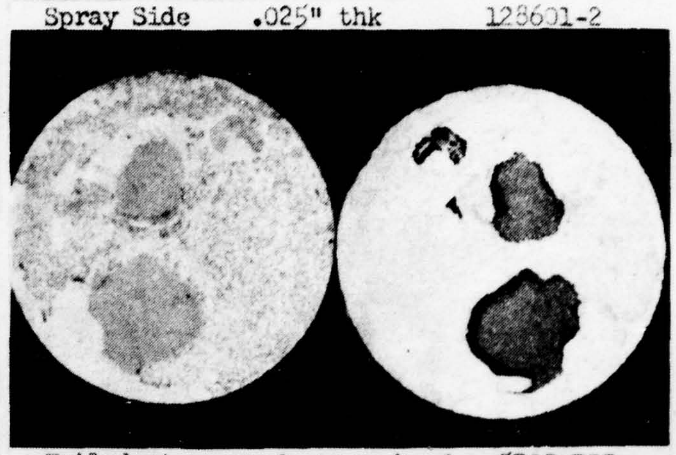
Figure 2

Spray Side .025" thk 128601-1



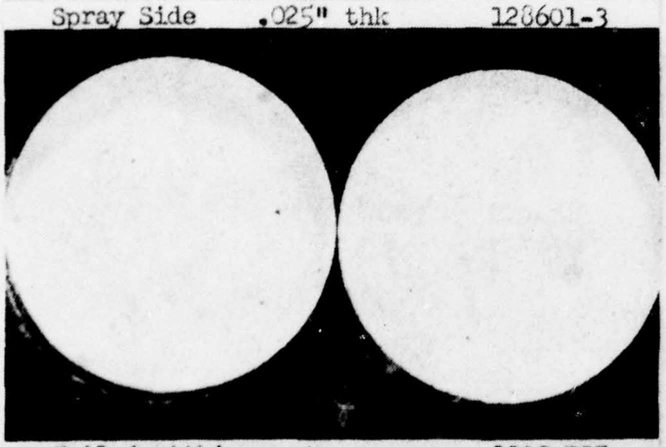
Failed at epoxy & spray bond 5700 PSI

Spray Side .025" thk 128601-2



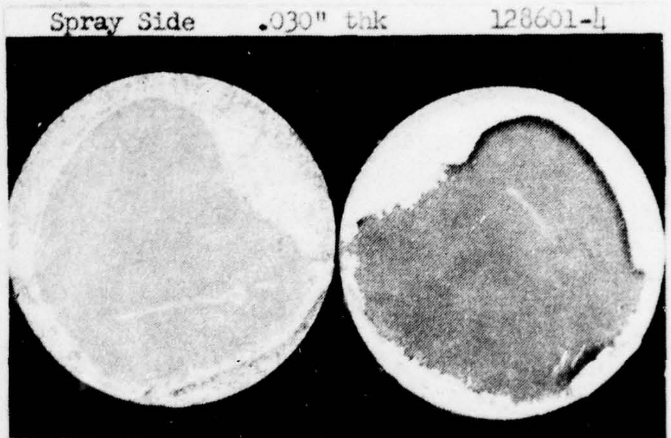
Failed at epoxy & spray bond 5700 PSI

Spray Side .025" thk 128601-3



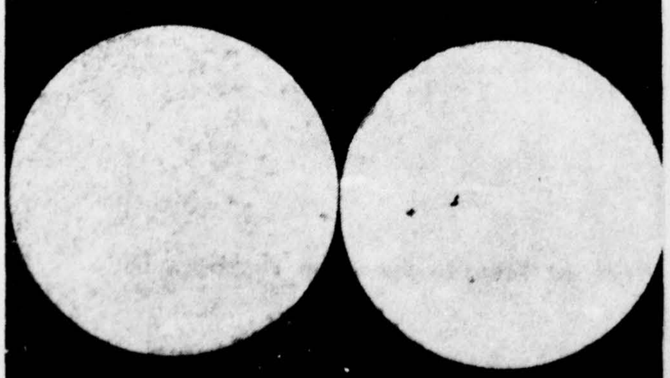
Failed within spray 3300 PSI

Spray Side .030" thk 128601-4



Failed at epoxy bond 5400 PSI

Spray Side .022" thk 128601-5

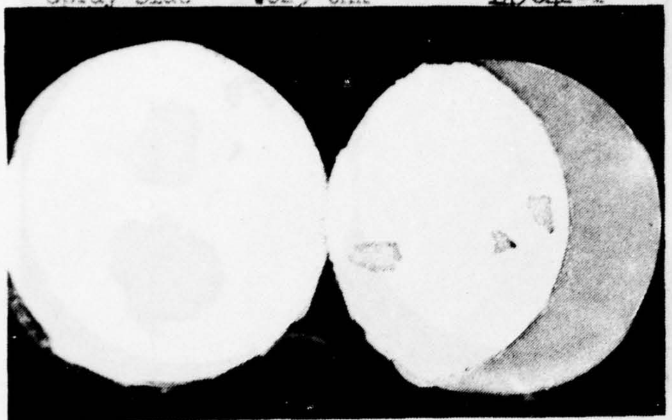


Failed at spray bond line 7600 PSI

Pulled Tensile Specimen Photographs

Figure 3

Spray Side .025"thk 149642-1

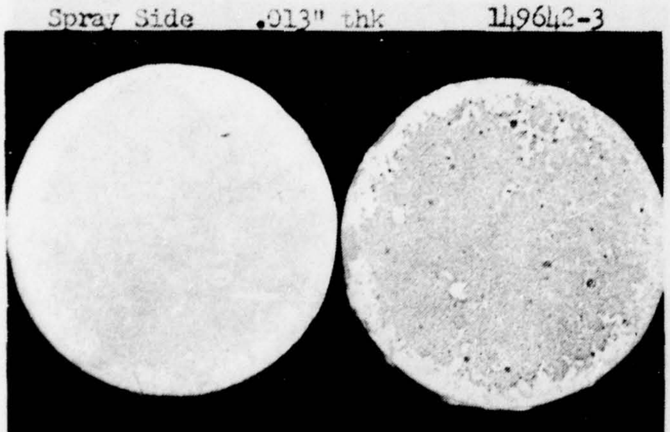


Failed at spray bond line 2550 PSI

Spray Side .014" thk 149642-2

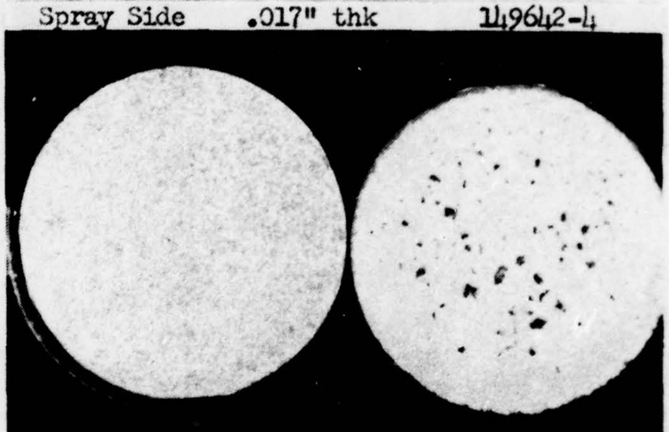
Failed at spray bond line 5400 PSI

Spray Side .013" thk 149642-3



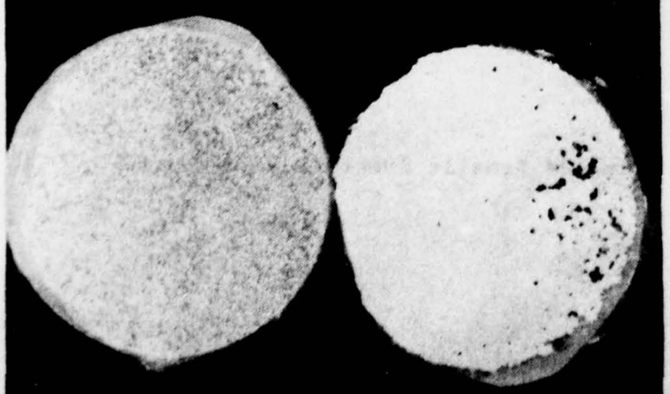
Failed at epoxy bond line 8450 PSI

Spray Side .017" thk 149642-4



Failed at spray bond line 6250 PSI

Spray Side .017" thk 149642-5

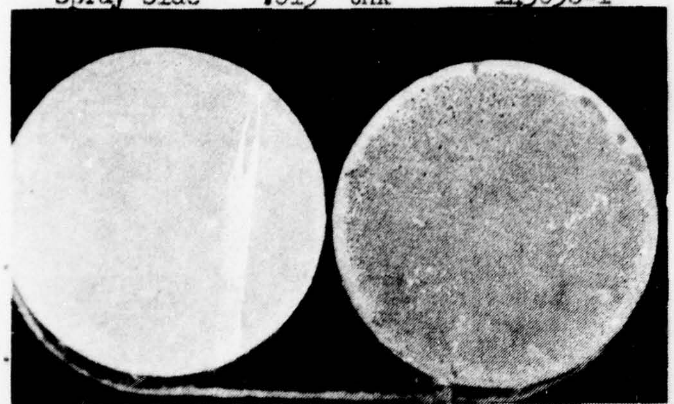


Failed at spray bond line 5900 PSI

Pulled Tensile Specimen Photographs

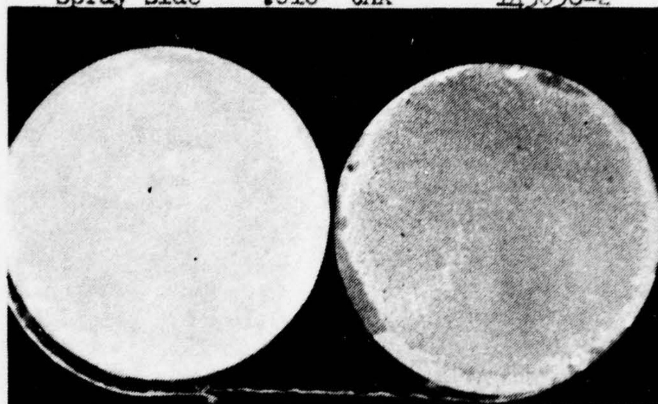
Figure 4

Spray Side .015" thk 143856-1



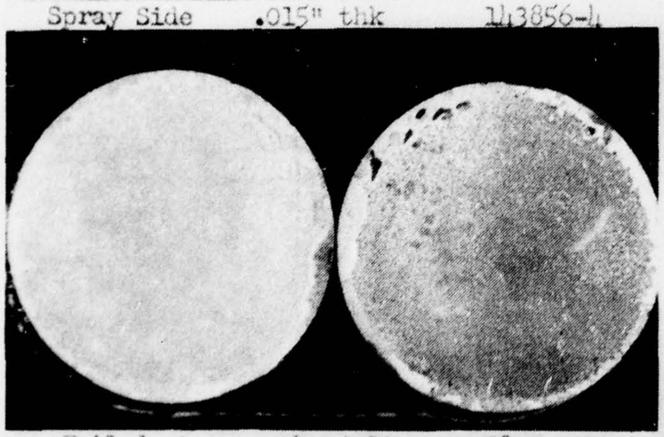
Failed at epoxy bond line 5700 PSI

Spray Side .018" thk 143856-2



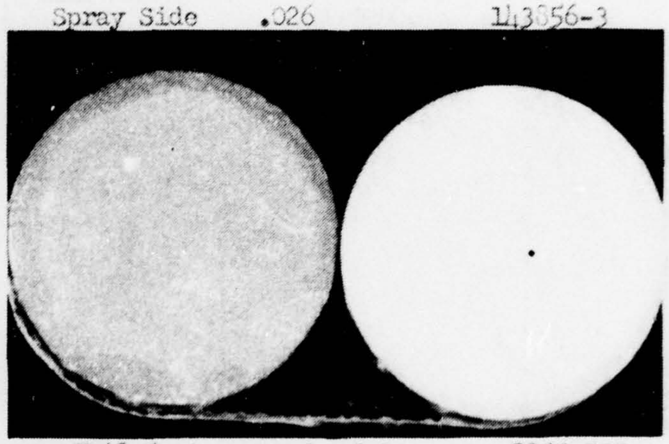
Failed at epoxy bond line 6800 PSI

Spray Side .015" thk 143856-4



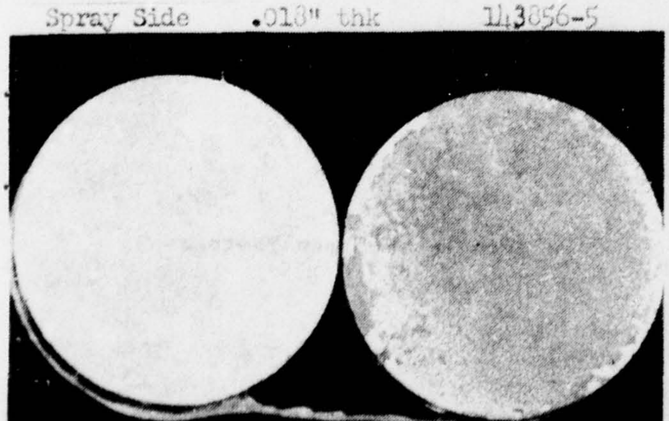
Failed at epoxy bond line 7800 PSI

Spray Side .026 143856-3



Failed at spray bond line 2100 PSI

Spray Side .018" thk 143856-5



Failed at epoxy bond line 8300 PSI

Pulled Tensile Specimen Photographs

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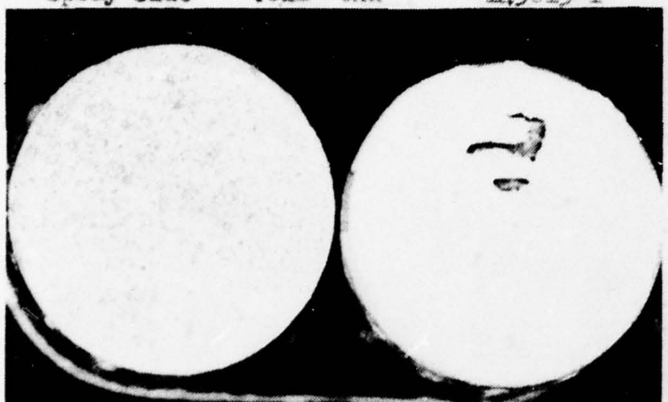
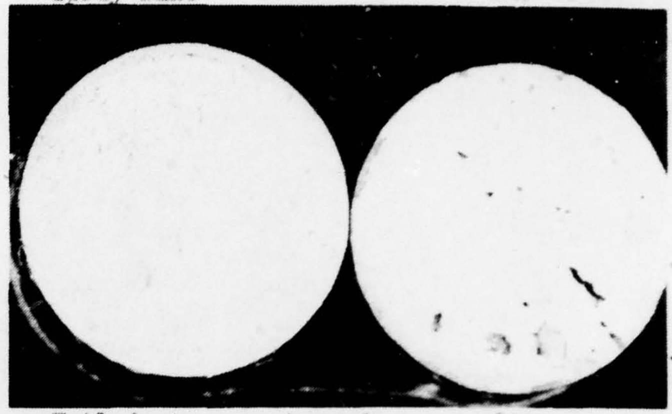
Figure 5

Spray Side .011" thk 143813-1



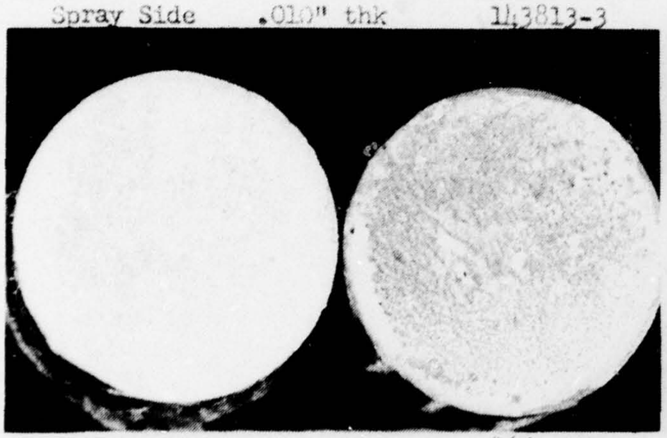
Failed at spray bond line 10,000 PSI

Spray Side .011" thk 143813-2



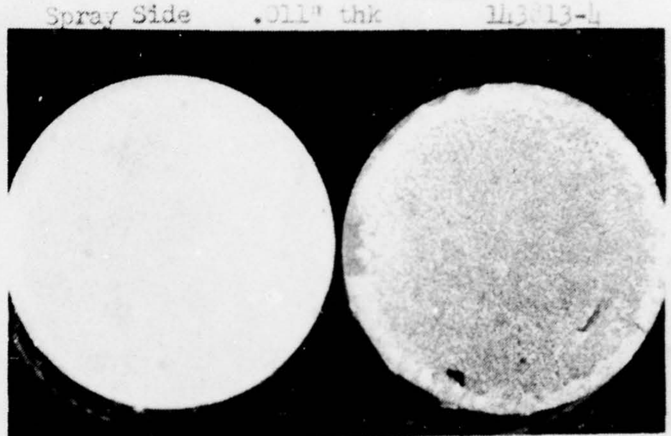
Failed at spray bond line 8200 PSI

Spray Side .010" thk 143813-3



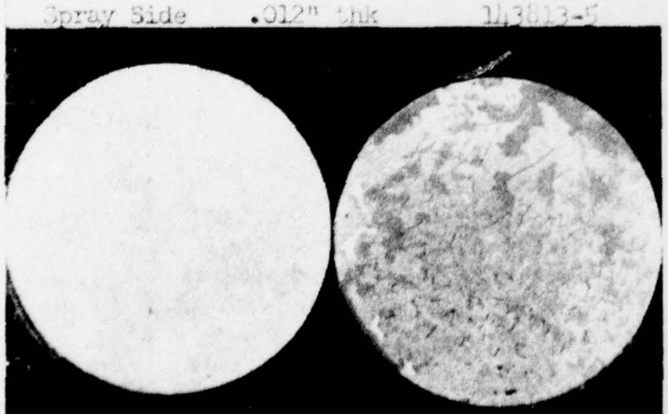
Failed at epoxy bond line 8650 PSI

Spray Side .011" thk 143813-4



Failed at epoxy bond line 8300 PSI

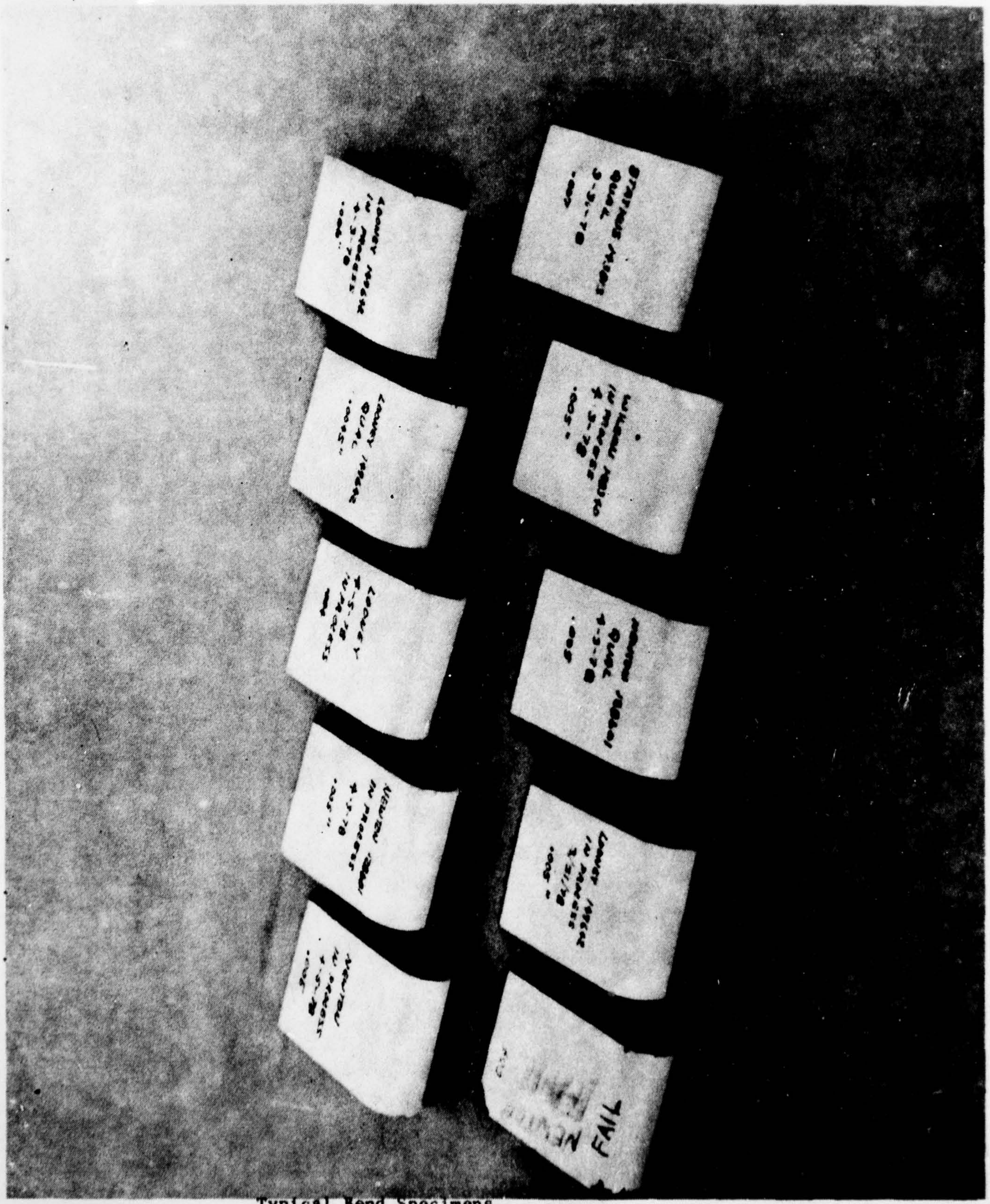
Spray Side .012" thk 143813-5



Failed at epoxy bond line 11,000 PSI

Pulled Tensile Specimen Photographs

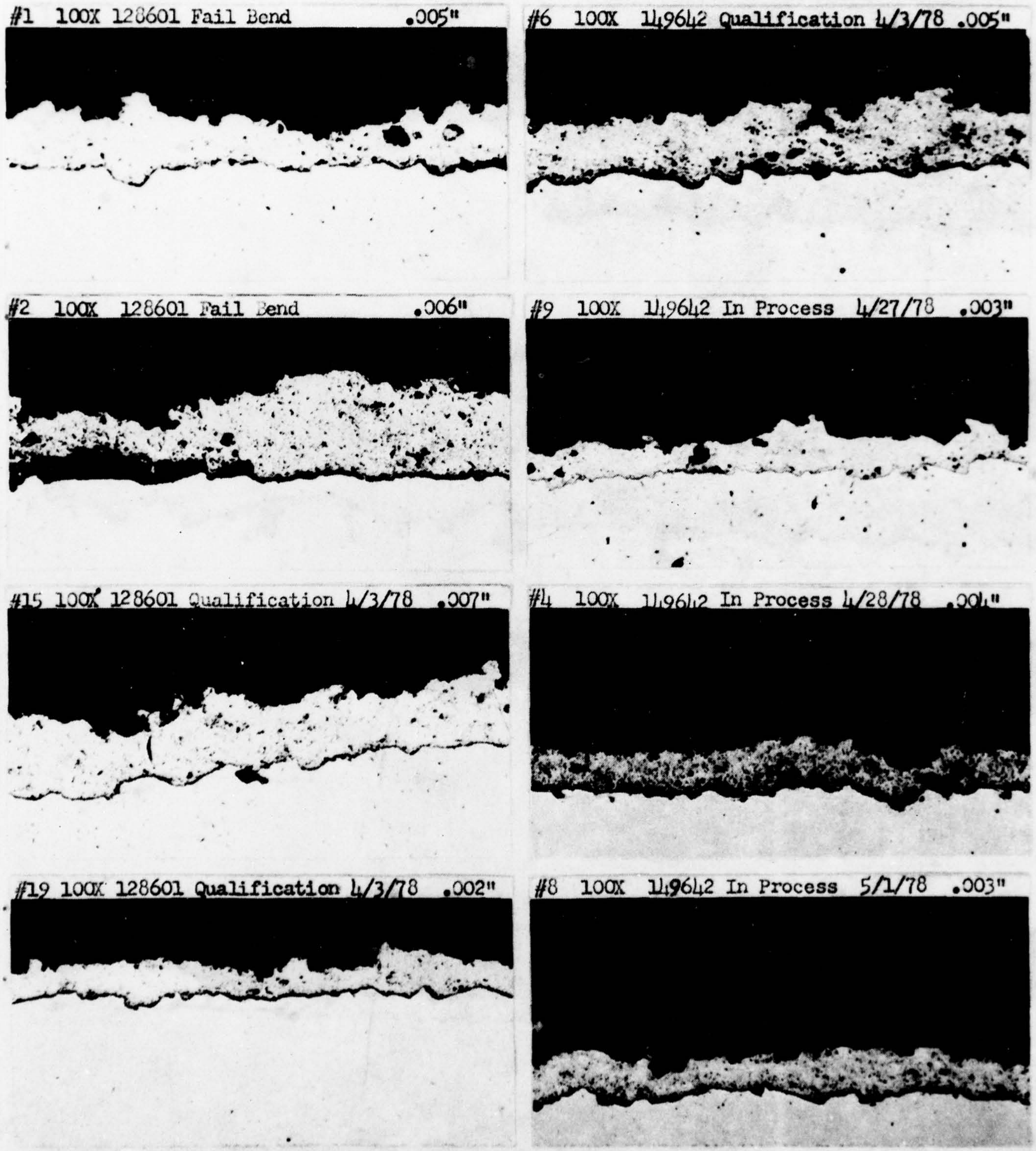
Figure 6



Typical Bend Specimens
Aluminum Spray on Carbon Steel

Figure 7

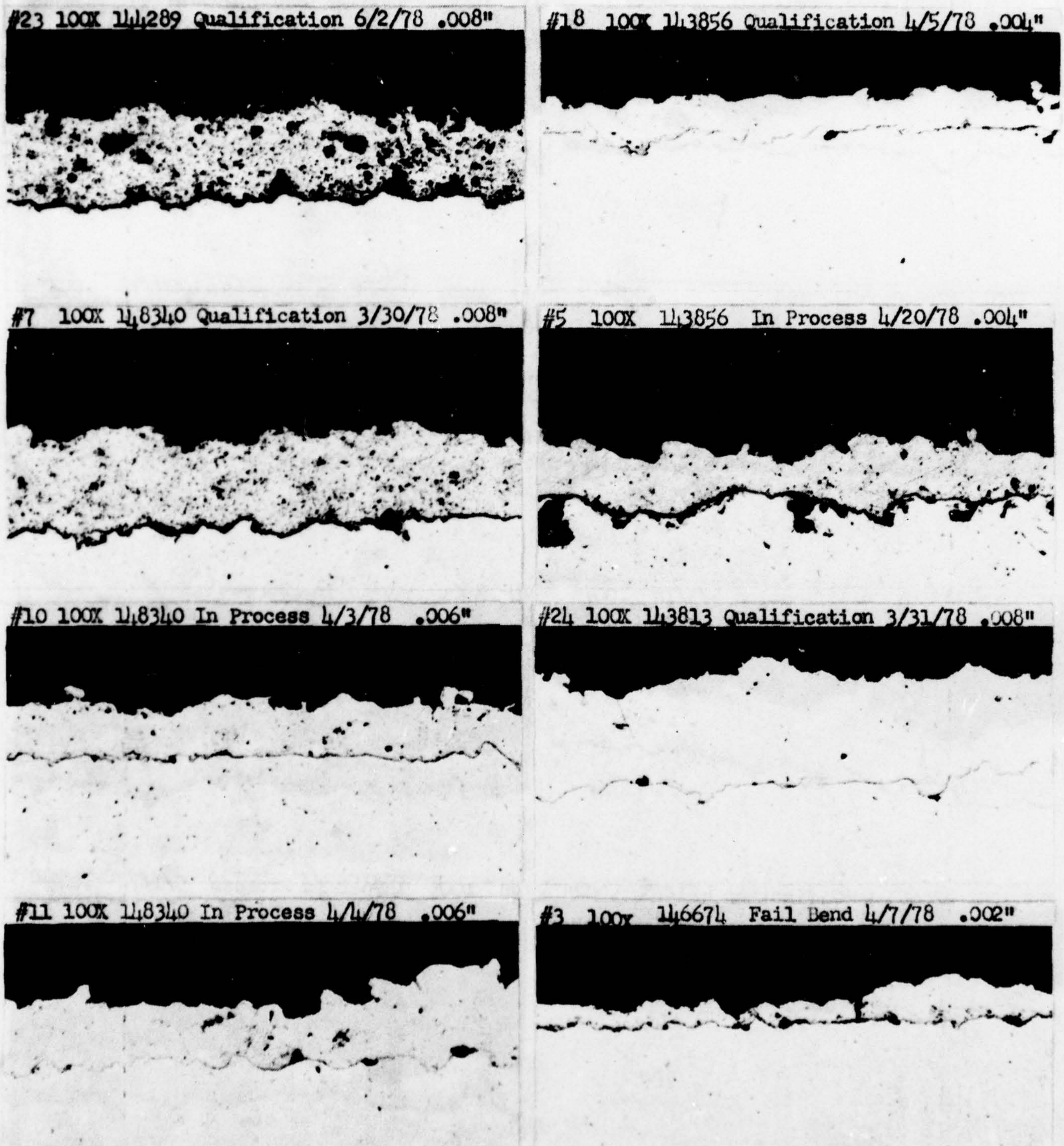
Typical Bend Specimens
Aluminum Spray on Carbon Steel
Figure 8



Carbon steel substrate is the light colored lower portion of each photograph

Microphotographs of Aluminum Spray Cross Sections

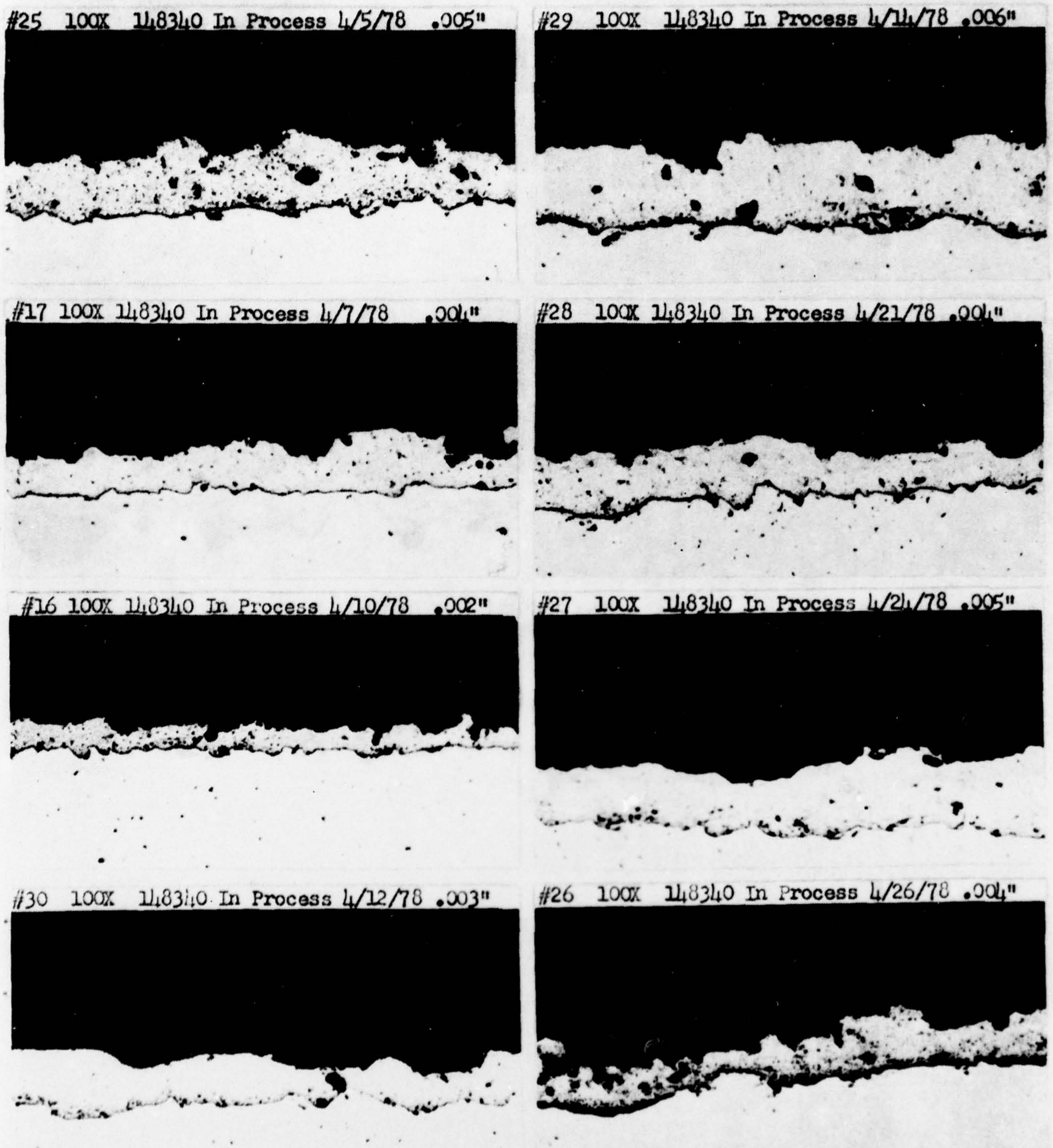
Figure 9



Carbon steel substrate is the light colored lower portion of each photograph

Microphotographs of Aluminum Spray Cross Sections

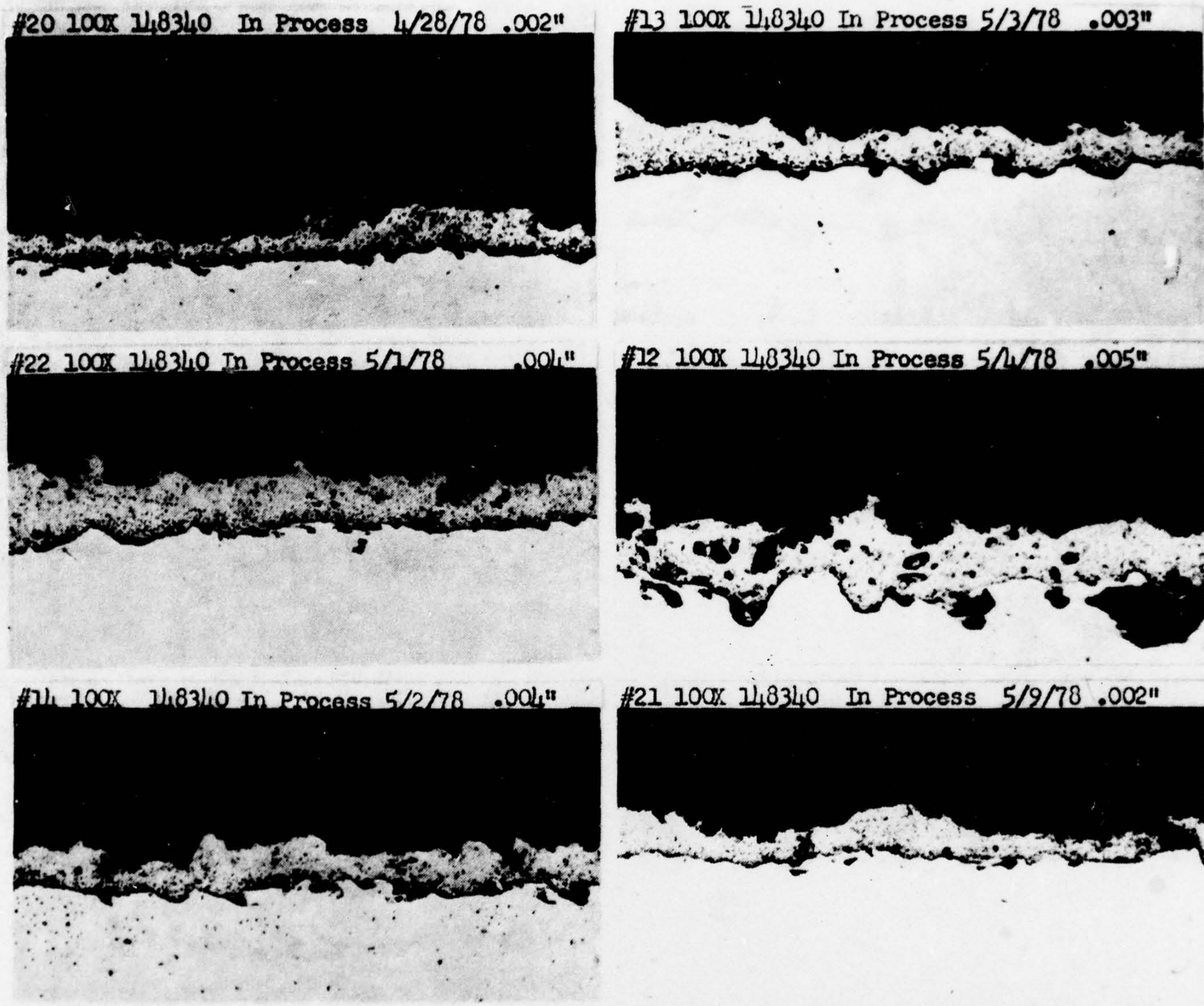
Figure 10



Carbon steel substrate is the light colored lower portion of each photograph

Microphotographs of Aluminum Spray Cross Sections

Figure 11



Carbon steel substrate is the light colored lower portion of each photograph.

Microphotographs of Aluminum Spray Cross Sections

Figure 12

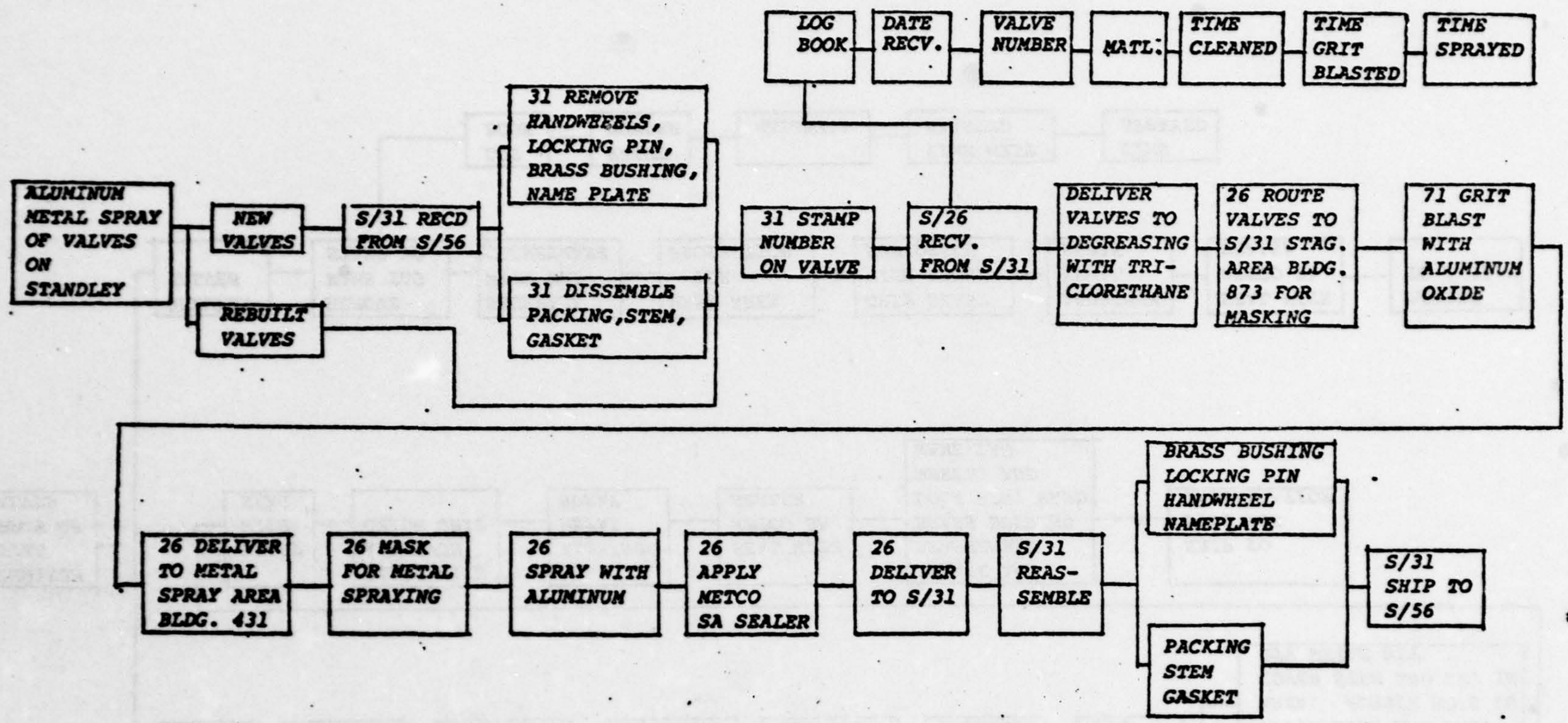

ALUMINUM METAL SPRAY OF VALVES ON STANDLEY
NEW VALVES
REBUILT VALVES
S/31 RECD FROM S/56
31 REMOVE HANDWHEELS, LOCKING PIN, BRASS BUSHING, NAME PLATE
31 DISSEMBLE PACKING, STEM, GASKET
31 STAMP NUMBER ON VALVE
LOG BOOK
DATE RECV.
VALVE NUMBER
MATL.
TIME CLEANED
TIME GRIT BLASTED
TIME SPRAYED
S/26 RECV. FROM S/31
DELIVER VALVES TO DEGREASING WITH TRI-CLORETHANE
26 ROUTE VALVES TO S/31 STAG. AREA BLDG. 873 FOR MASKING
71 GRIT BLAST WITH ALUMINUM OXIDE
26 DELIVER TO METAL SPRAY AREA BLDG. 431
26 MASK FOR METAL SPRAYING
26 SPRAY WITH ALUMINUM
26 APPLY METCO SA SEALER
26 DELIVER TO S/31
S/31 REAS-SEMBLE
BRASS BUSHING LOCKING PIN HANDWHEEL NAMEPLATE
PACKING STEM GASKET
S/31 SHIP TO S/56

Figure 13

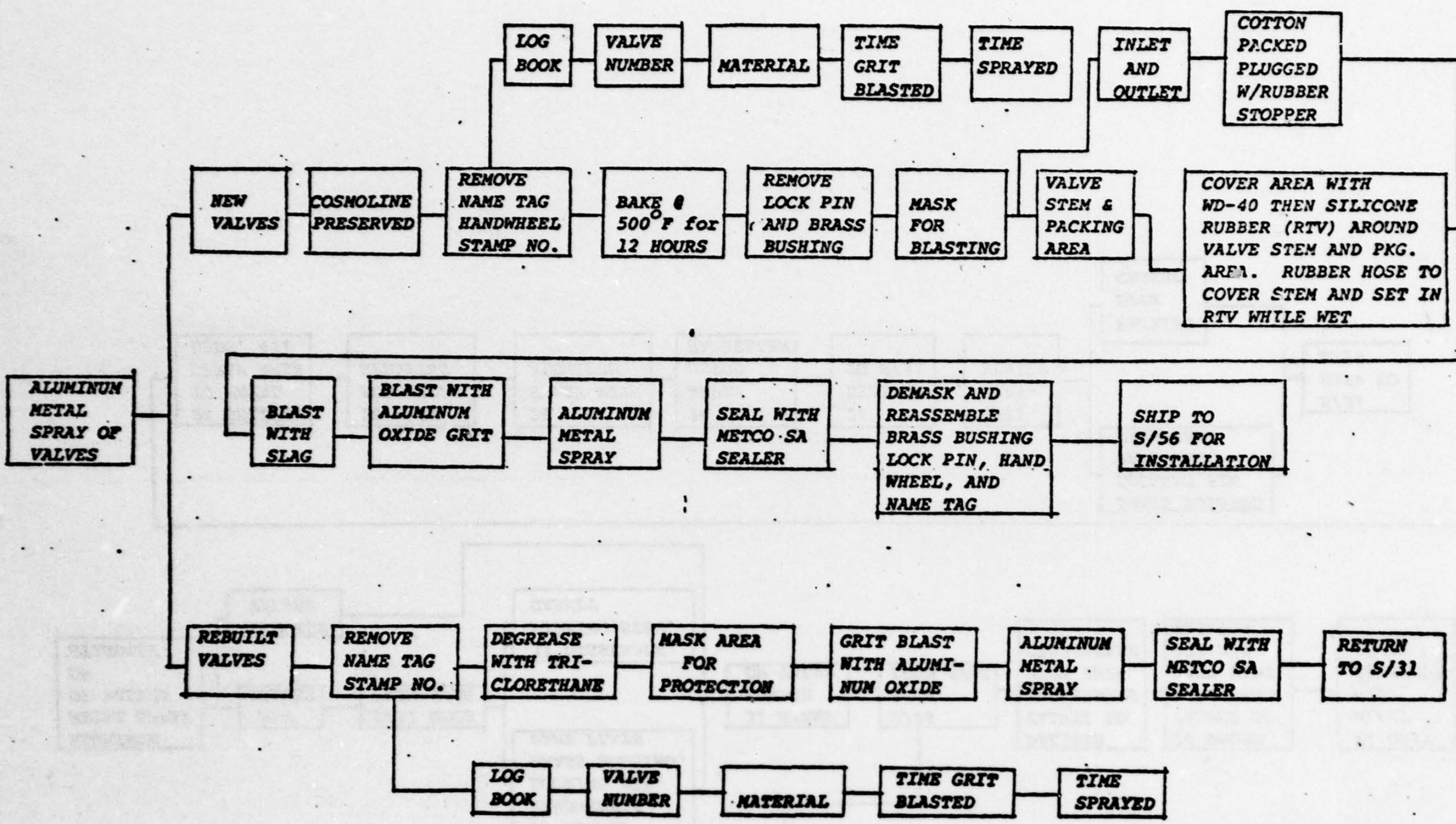

ALUMINUM METAL SPRAY OF VALVES
NEW VALVES
COSMOLINE PRESERVED
REMOVE NAME TAG HANDWHEEL STAMP NO.
LOG BOOK
VALVE NUMBER
MATERIAL
TIME GRIT BLASTED
TIME SPRAYED
INLET AND OUTLET
COTTON PACKED PLUGGED W/RUBBER STOPPER
BAKE @ 500°F for 12 HOURS
REMOVE LOCK PIN AND BRASS BUSHING
MASK FOR BLASTING
VALVE STEM & PACKING AREA
COVER AREA WITH WD-40 THEN SILICONE RUBBER (RTV) AROUND VALVE STEM AND PKG. AREA. RUBBER HOSE TO COVER STEM AND SET IN RTV WHILE WET
BLAST WITH SLAG
BLAST WITH ALUMINUM OXIDE GRIT
ALUMINUM METAL SPRAY
SEAL WITH METCO SA SEALER
DEMASK AND REASSEMBLE BRASS BUSHING LOCK PIN, HAND WHEEL, AND NAME TAG
SHIP TO S/56 FOR INSTALLATION
REBUILT VALVES
REMOVE NAME TAG STAMP NO.
DEGREASE WITH TRI-CLORETHANE
MASK AREA FOR PROTECTION
GRIT BLAST WITH ALUMINUM OXIDE
ALUMINUM METAL SPRAY
SEAL WITH METCO SA SEALER
RETURN TO S/31
LOG BOOK
VALVE NUMBER
MATERIAL
TIME GRIT BLASTED
TIME SPRAYED

Figure 14

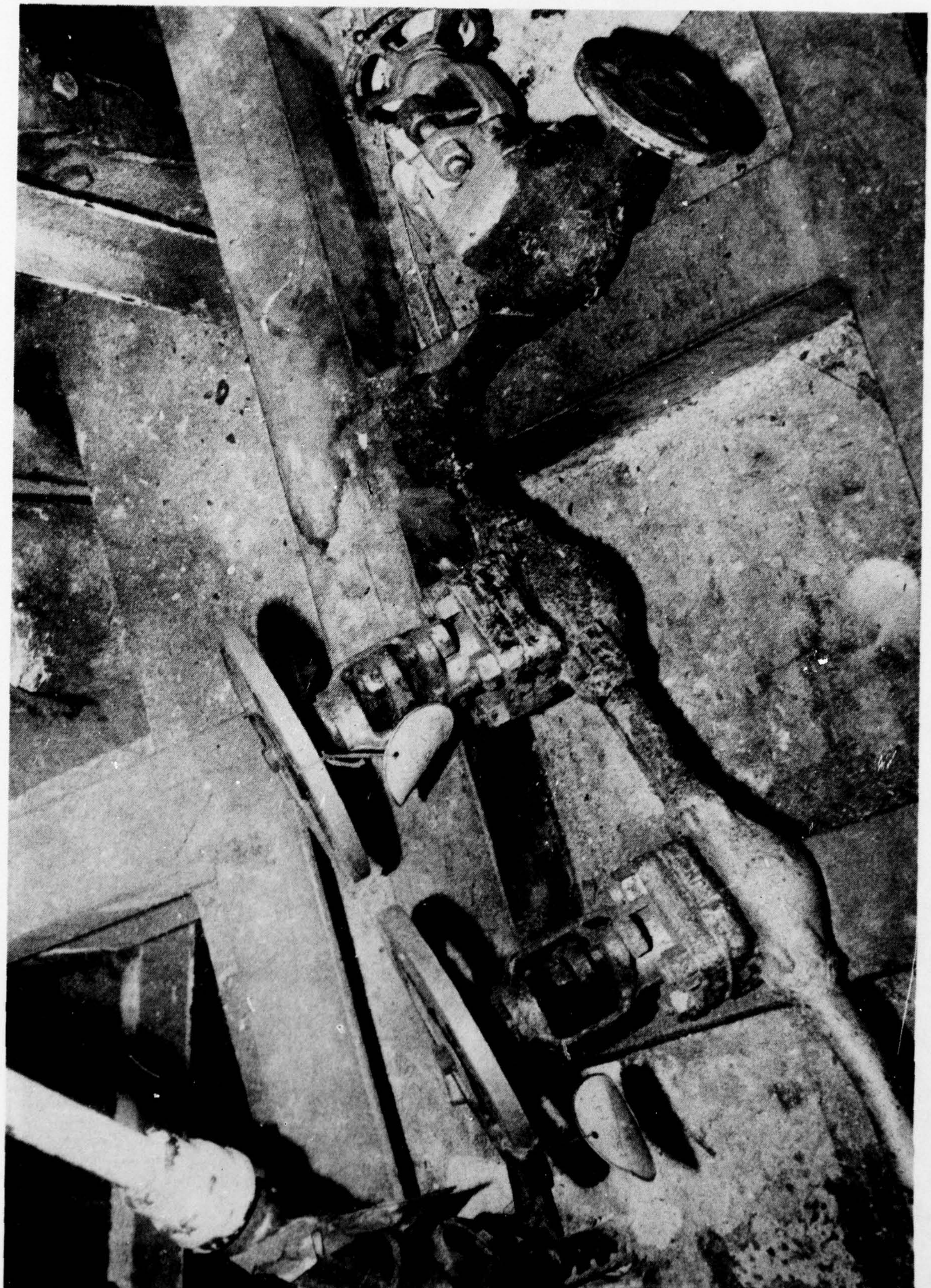


FIG 15

41

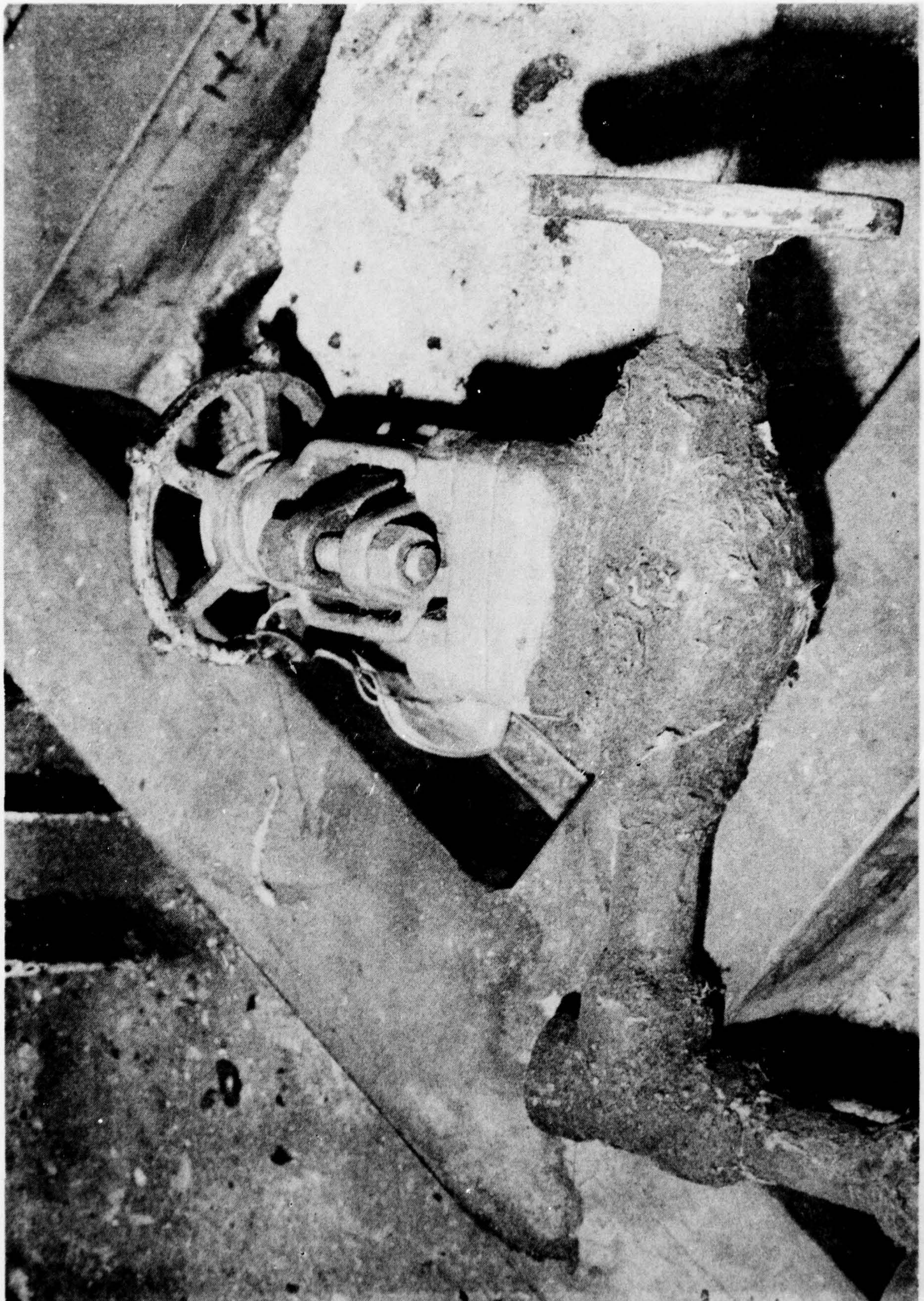


FIG 16

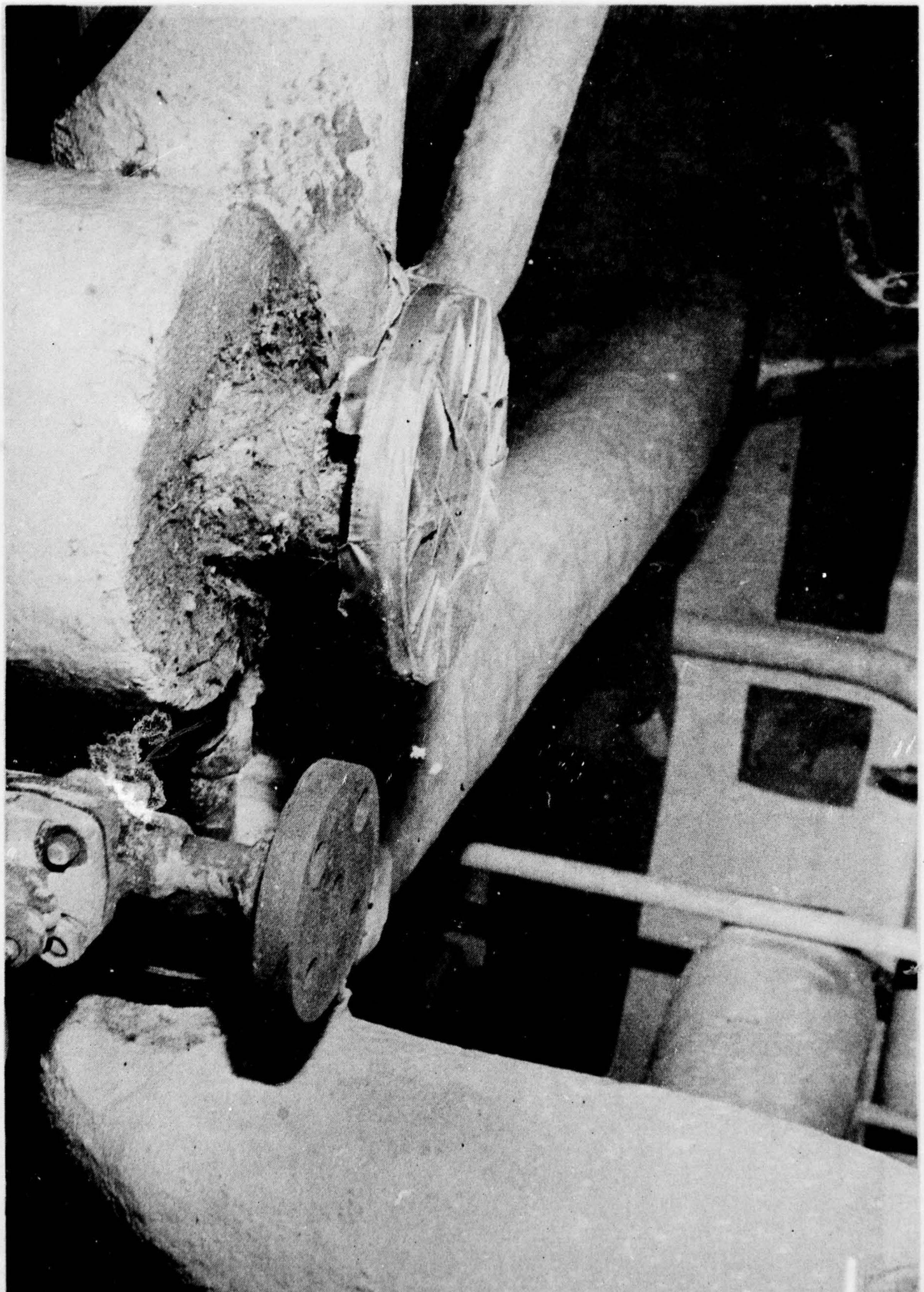


FIG 17

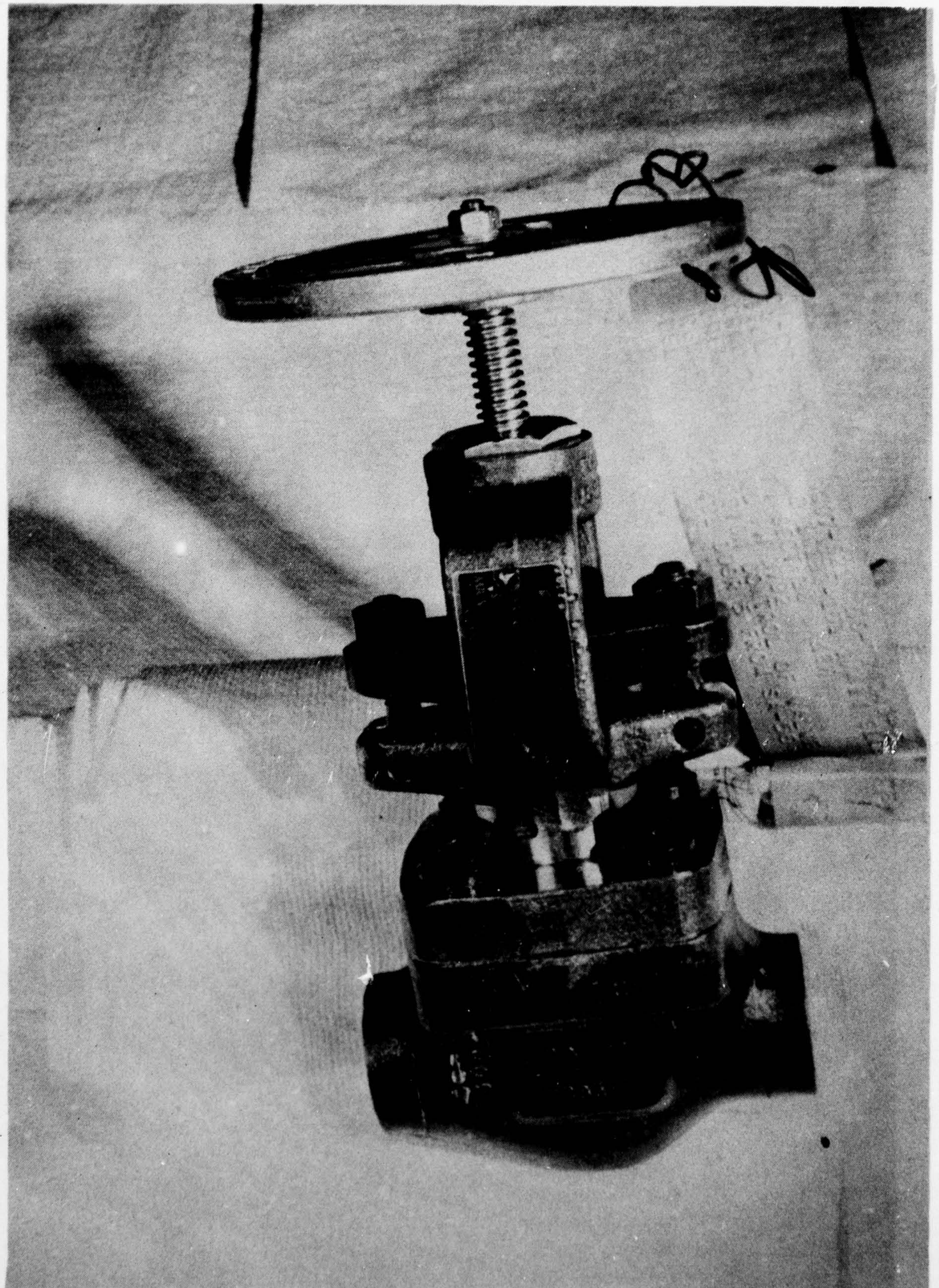


FIG 18

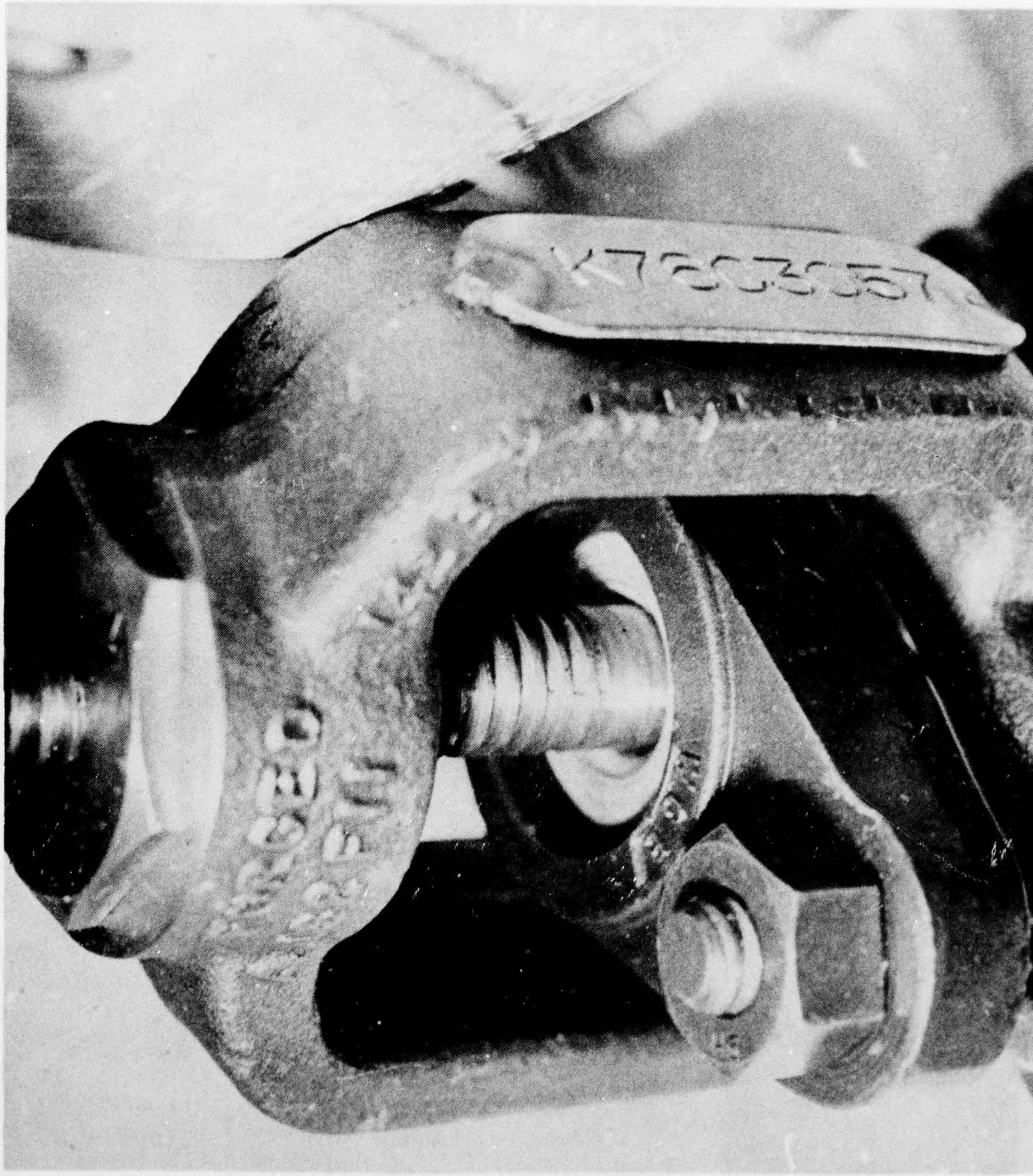


FIG 19

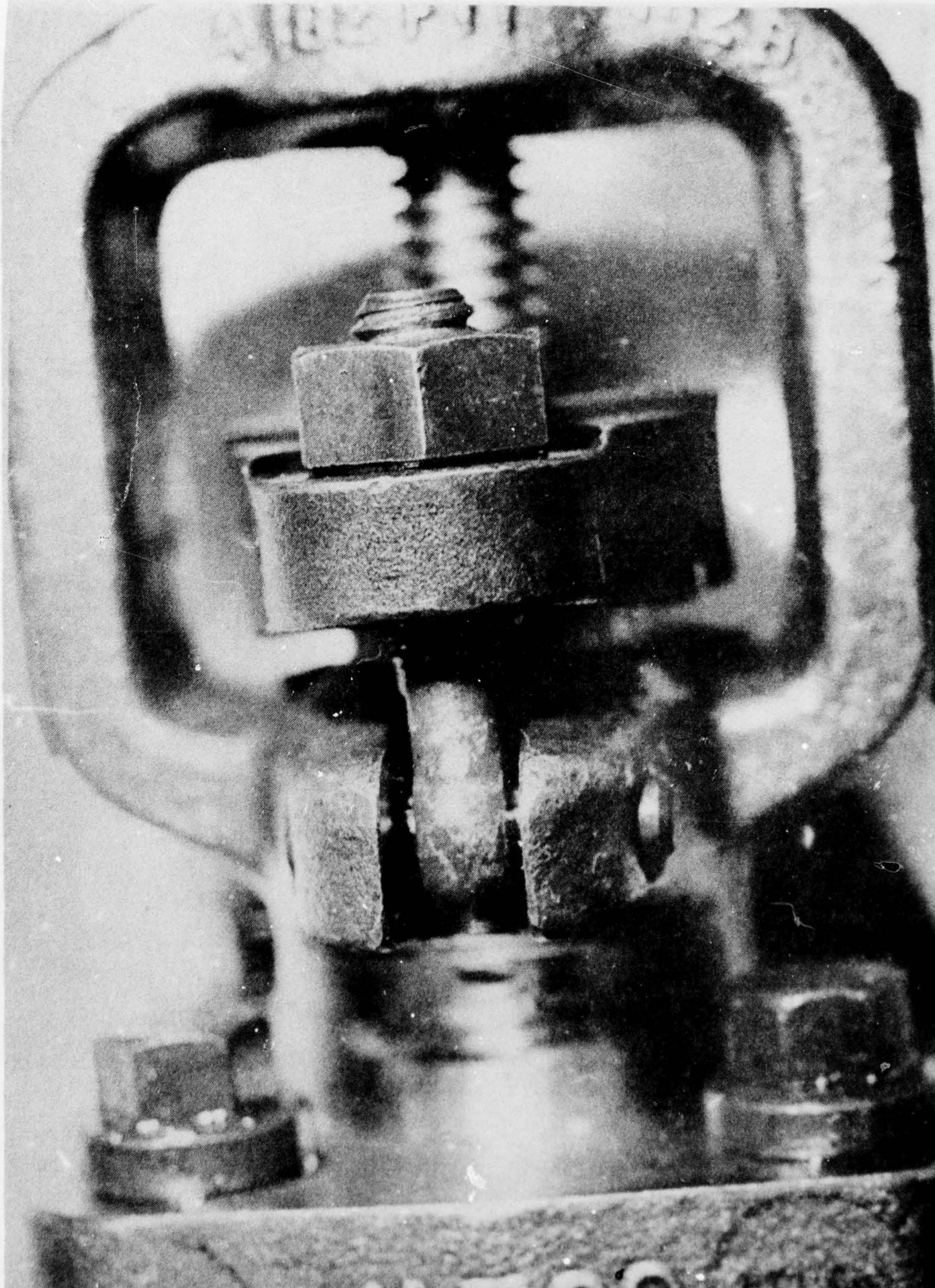


FIG 20

FIG 21

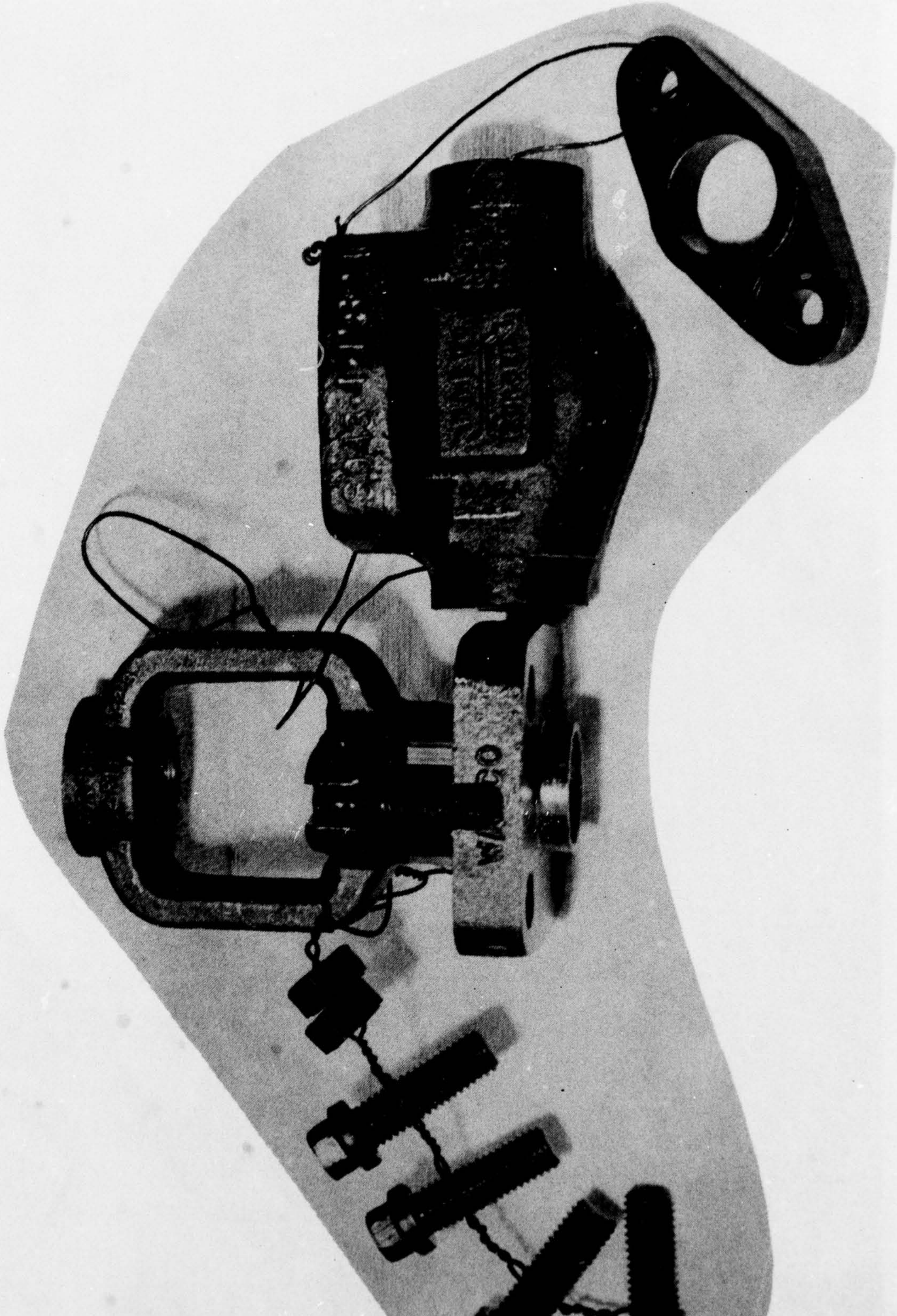


FIG 22

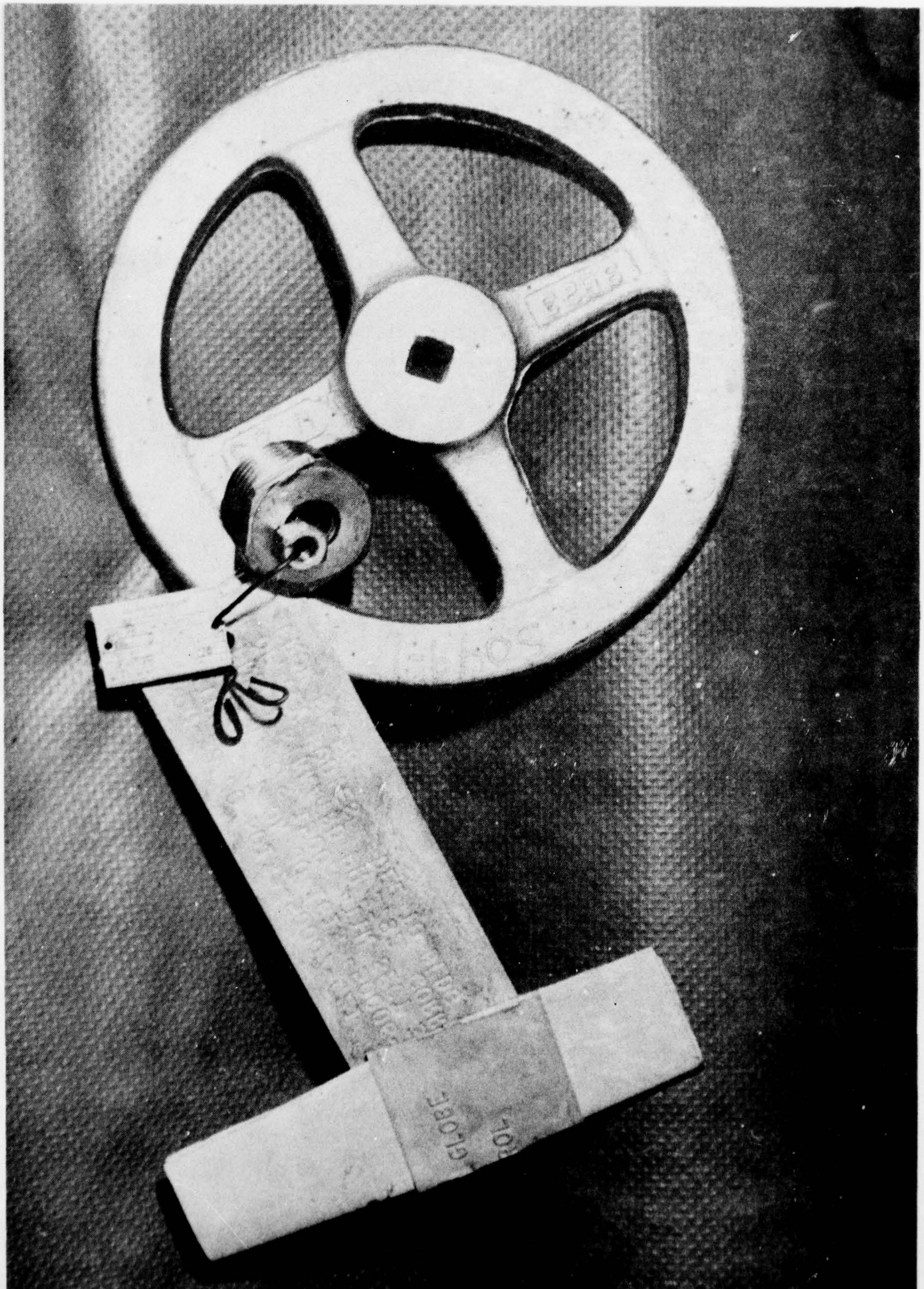


FIG 23

FIG 24

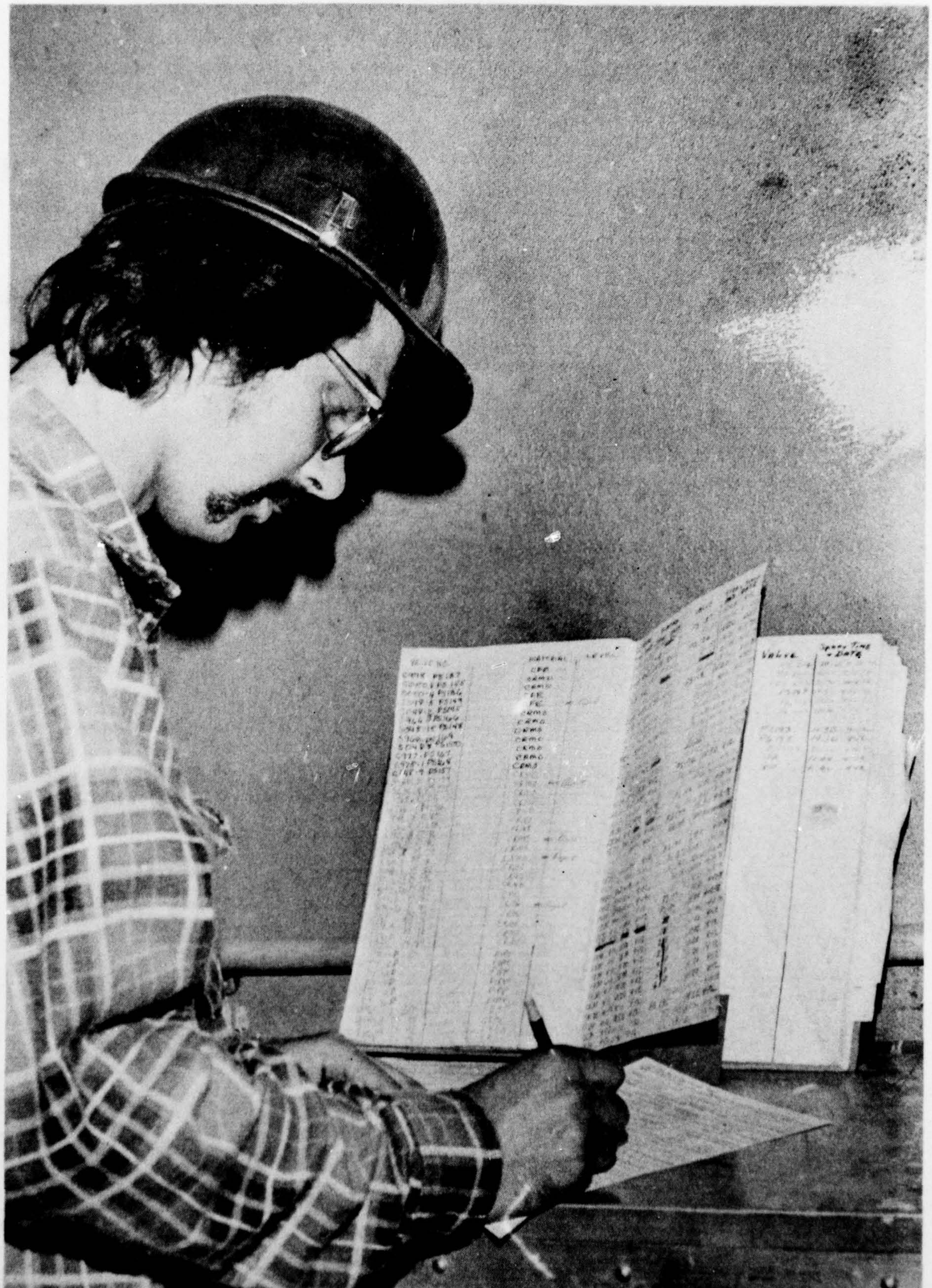


FIG 25

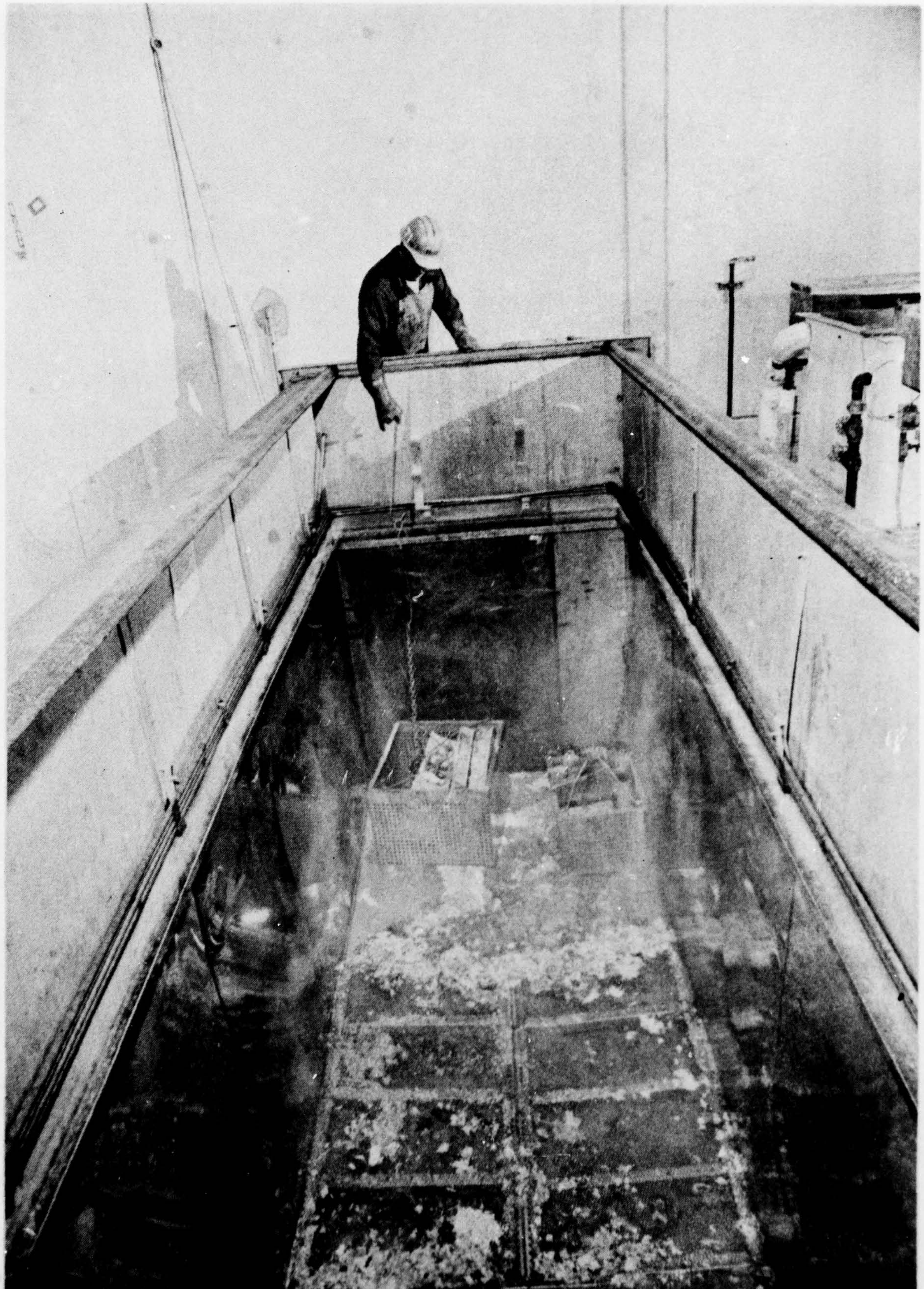


FIG 26

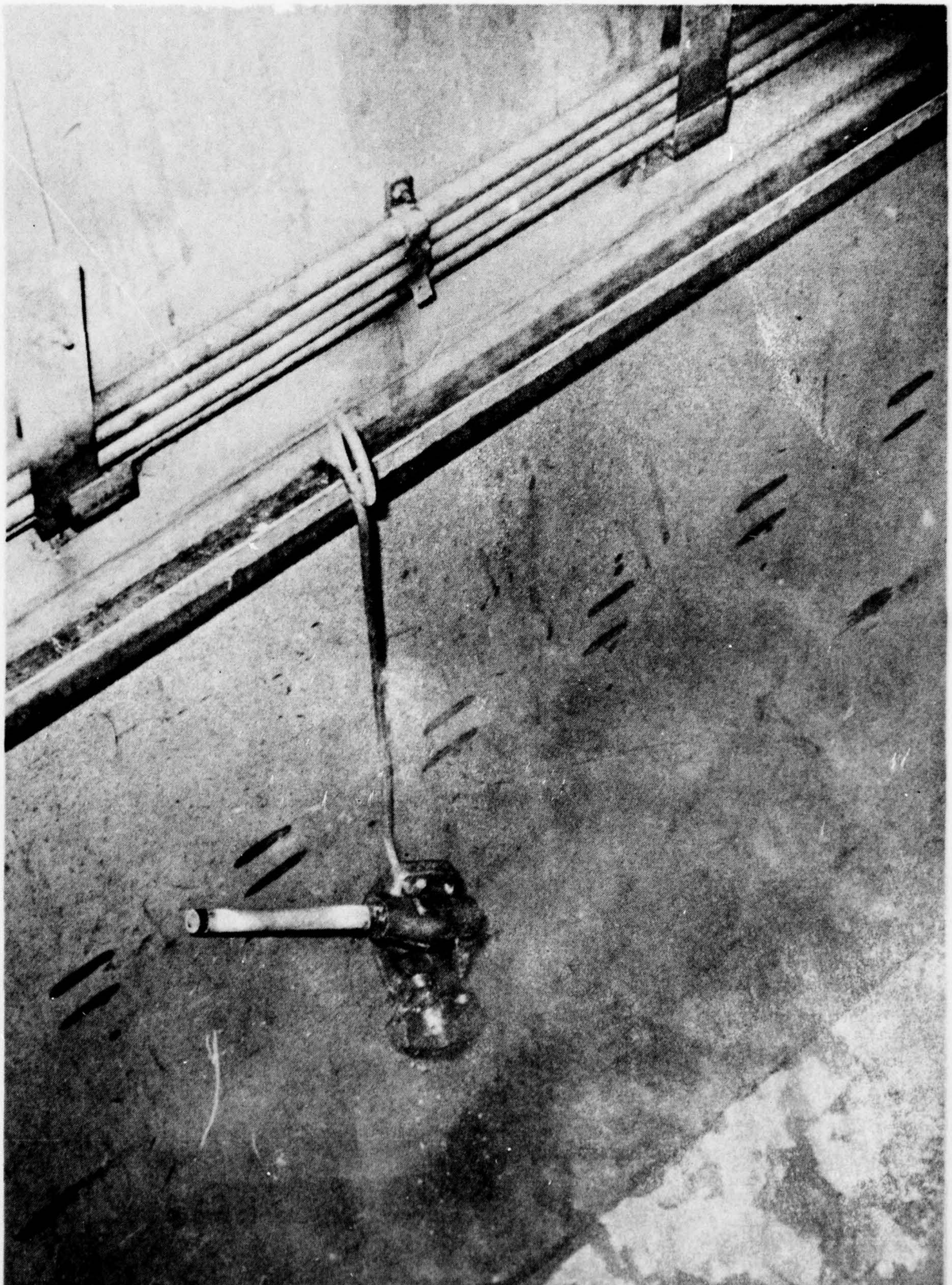


FIG 27

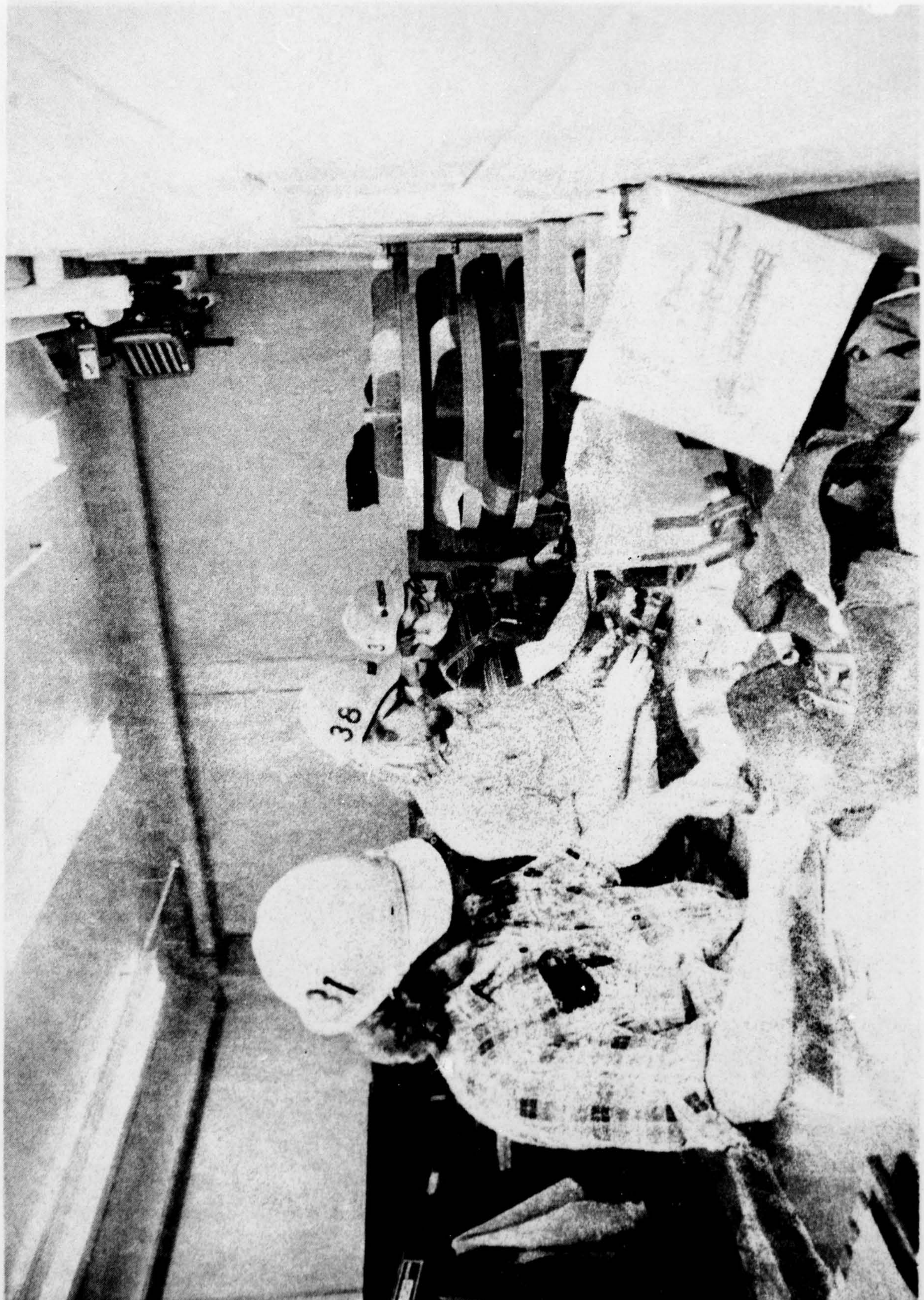


FIG 28

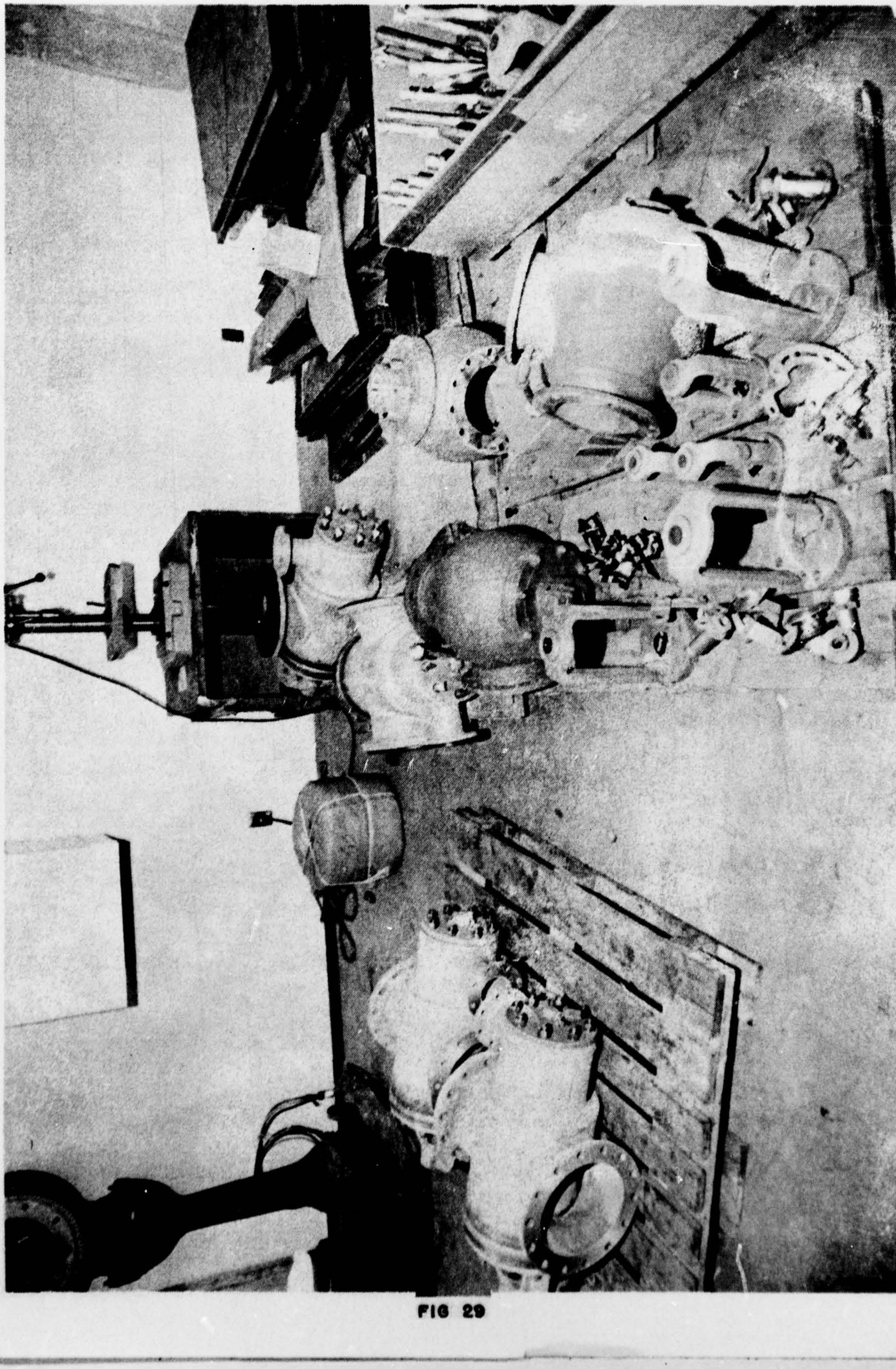


FIG 29

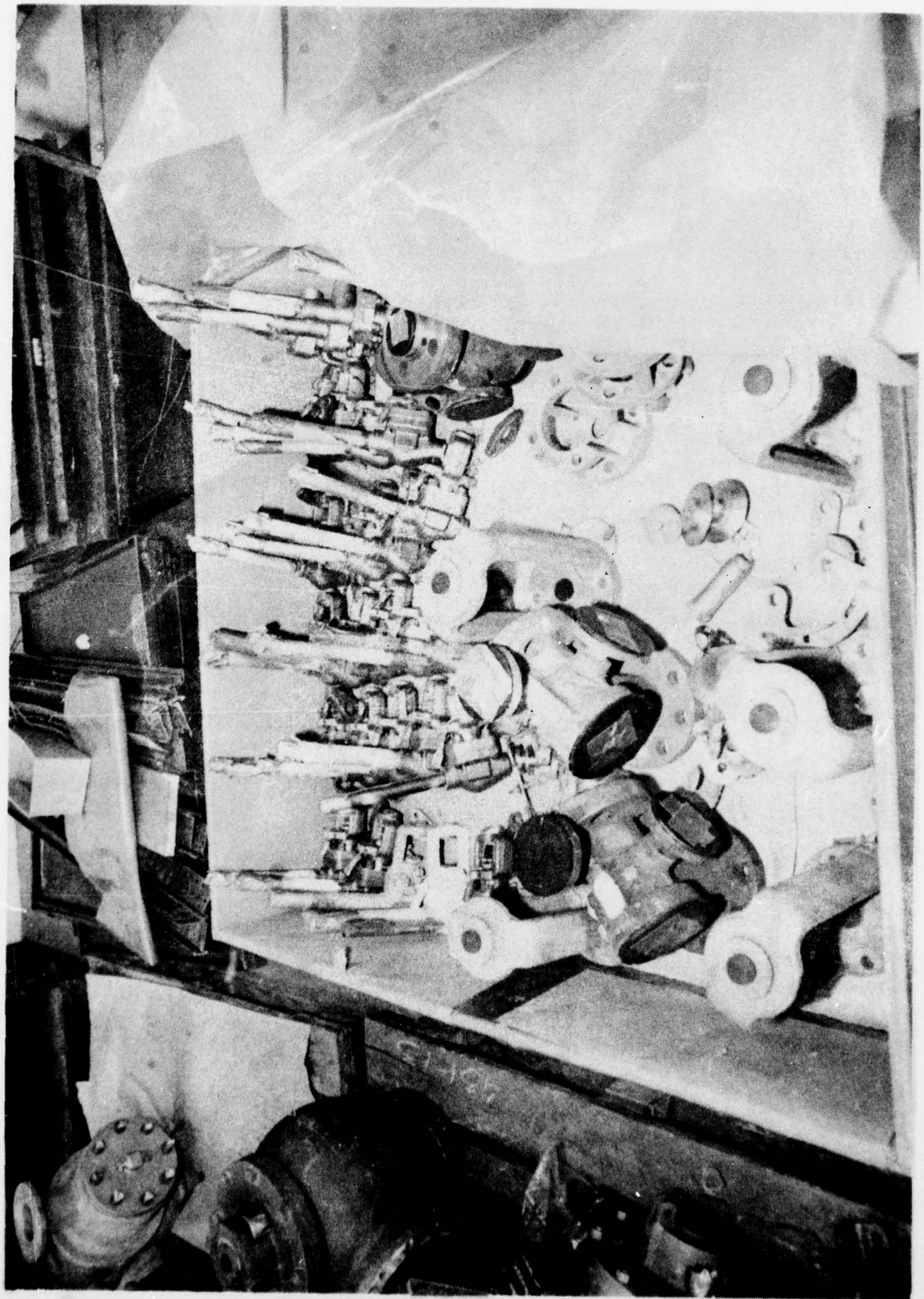


FIG 30

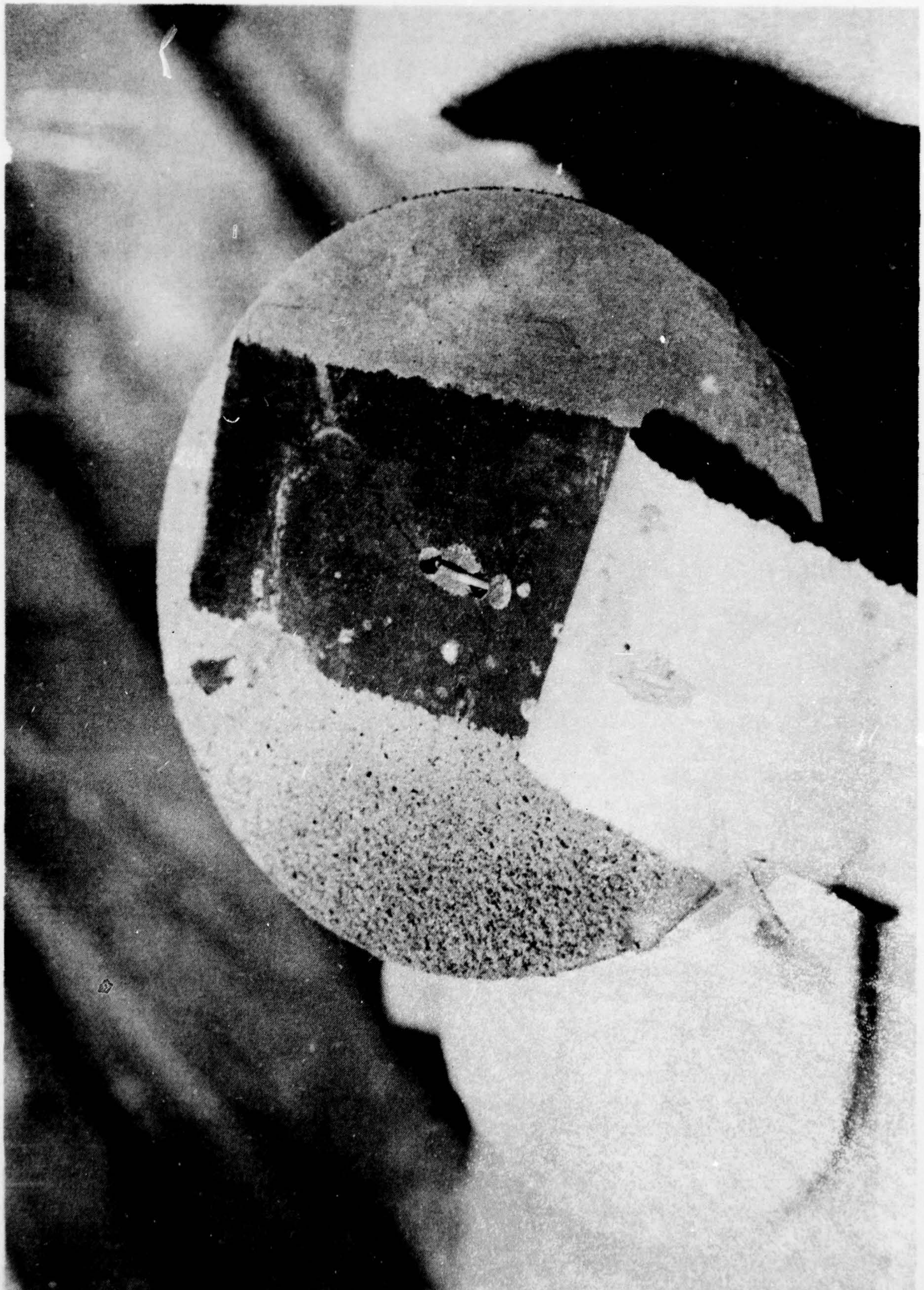


FIG 31

FIG 32

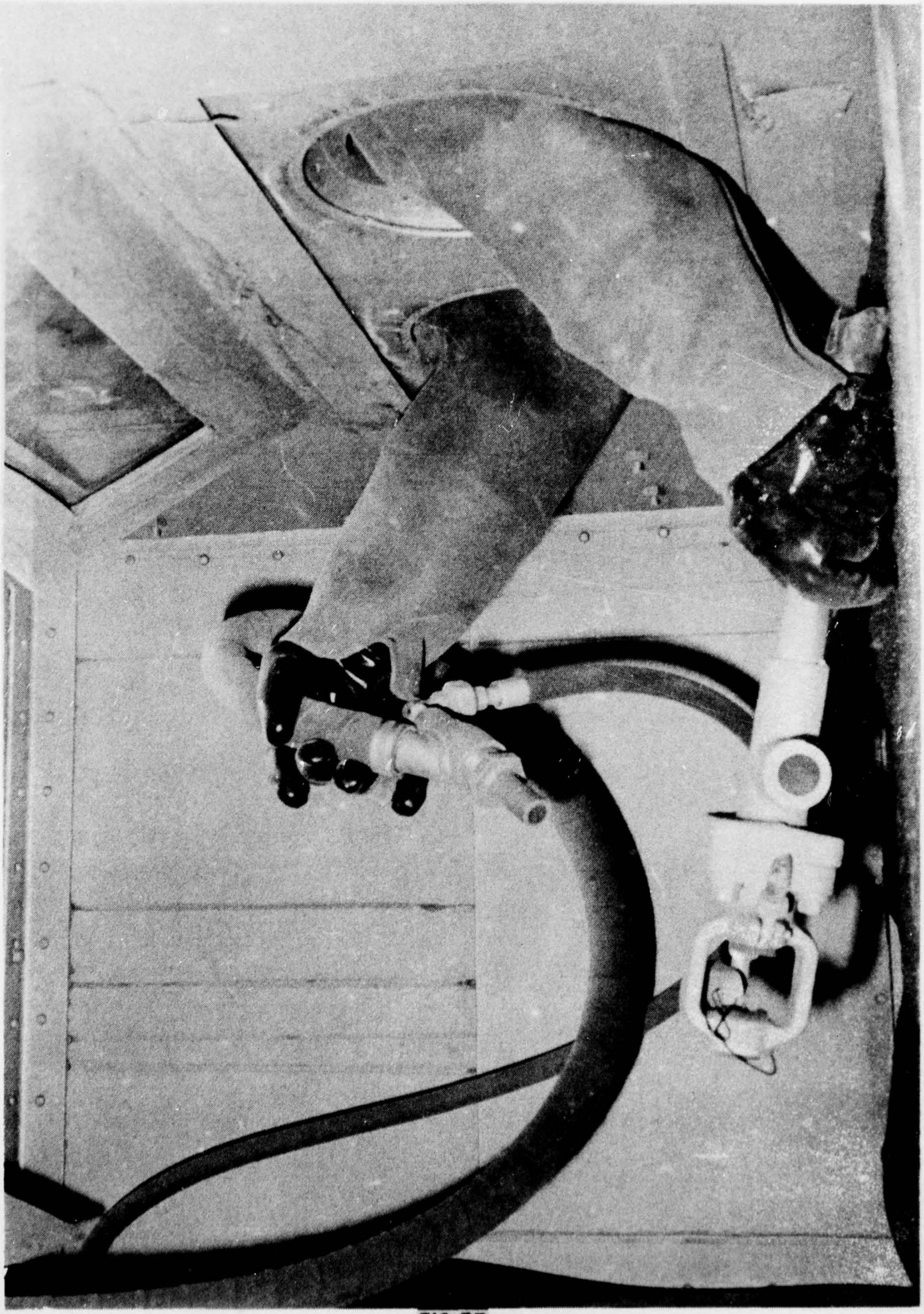


FIG 33

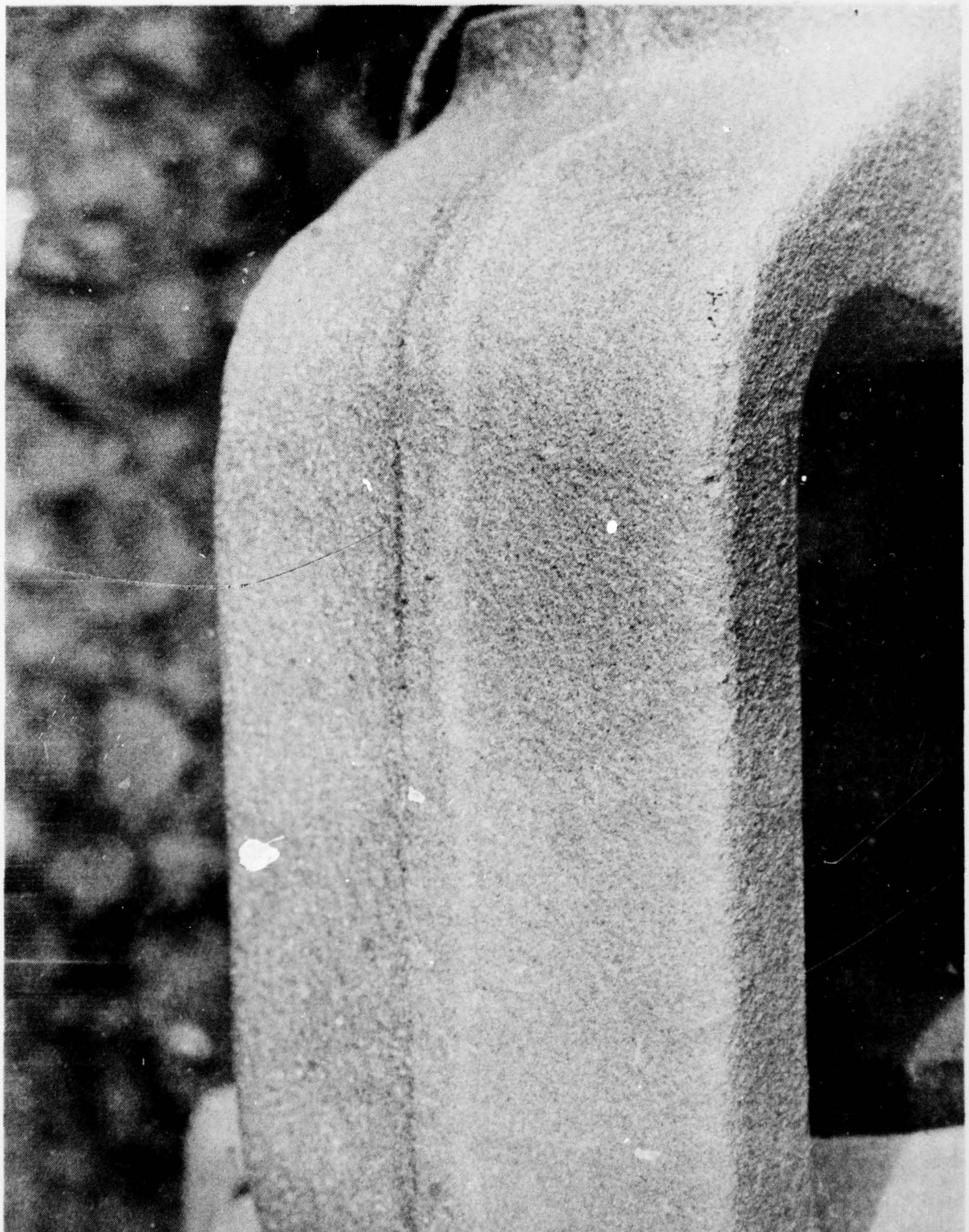


FIG 34

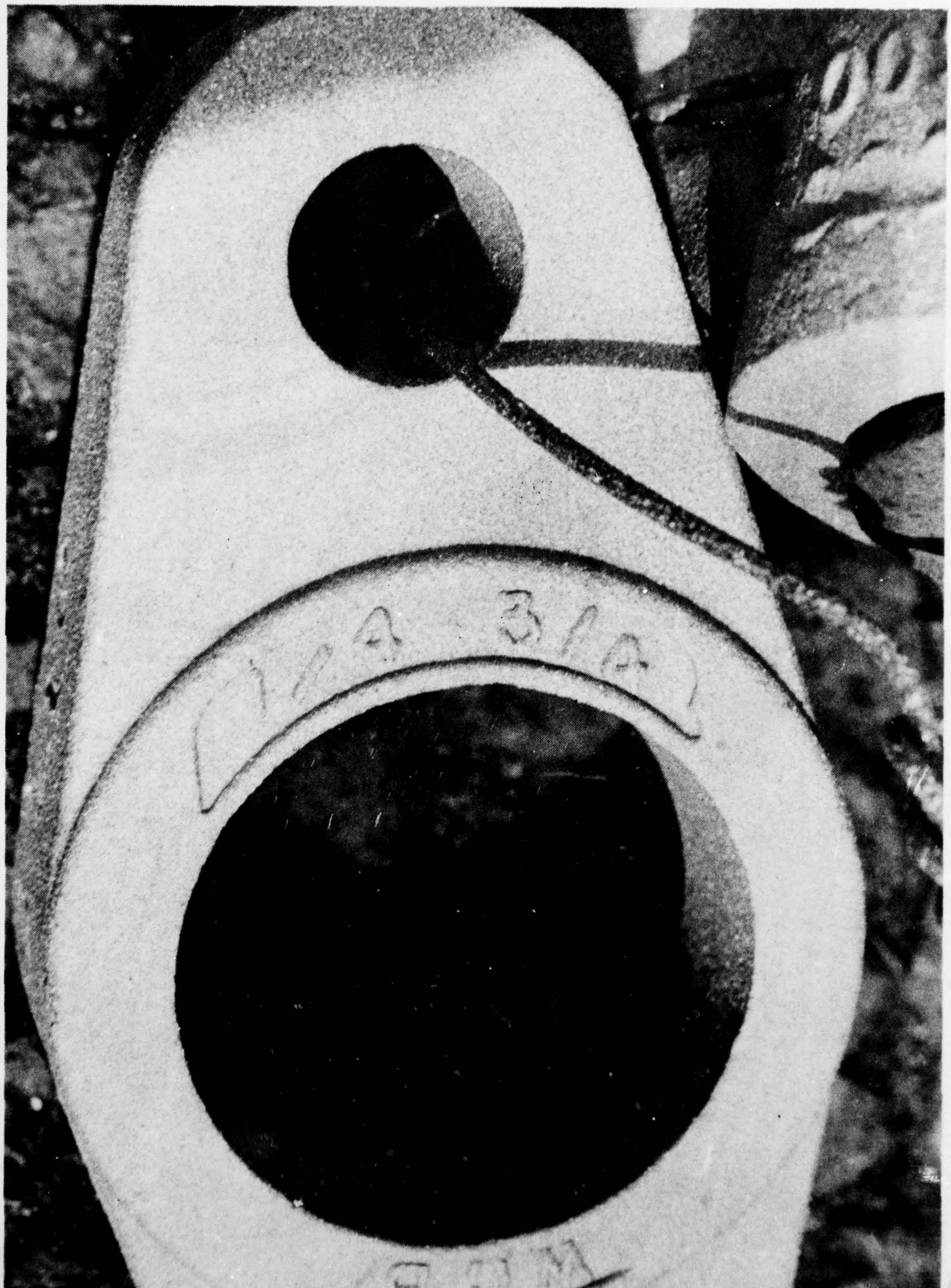


FIG 35

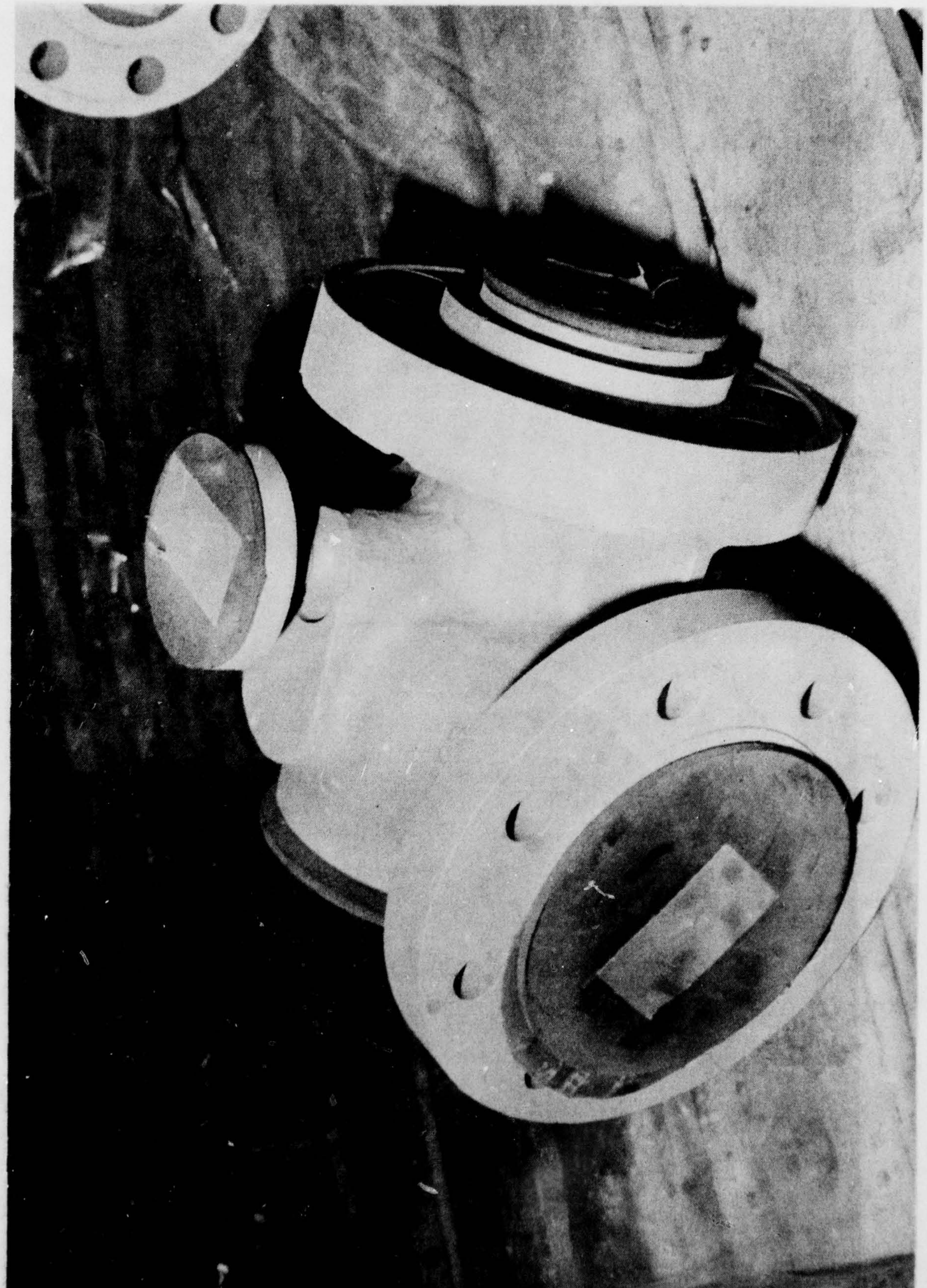


FIG 36

FIG 37

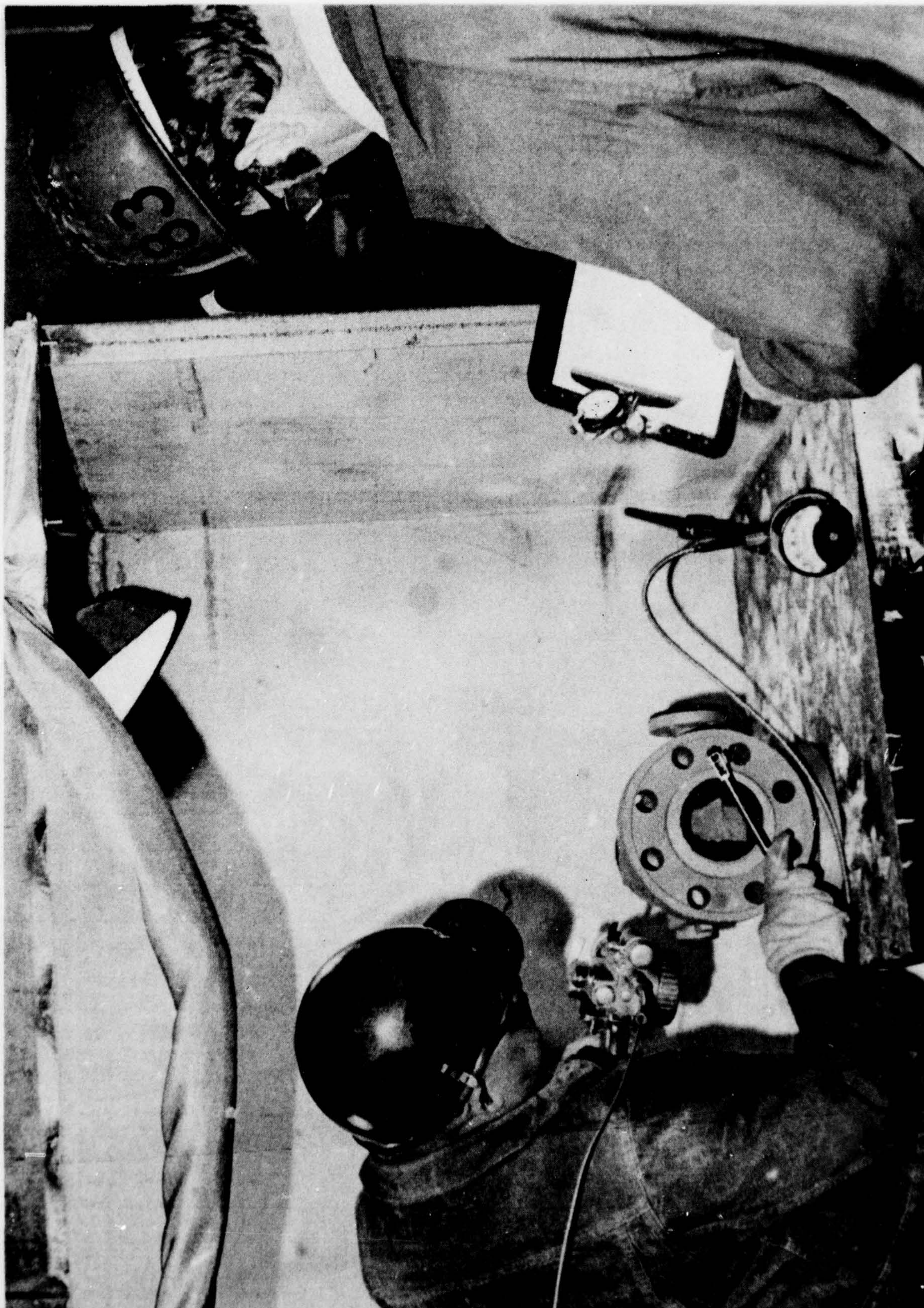


FIG 38

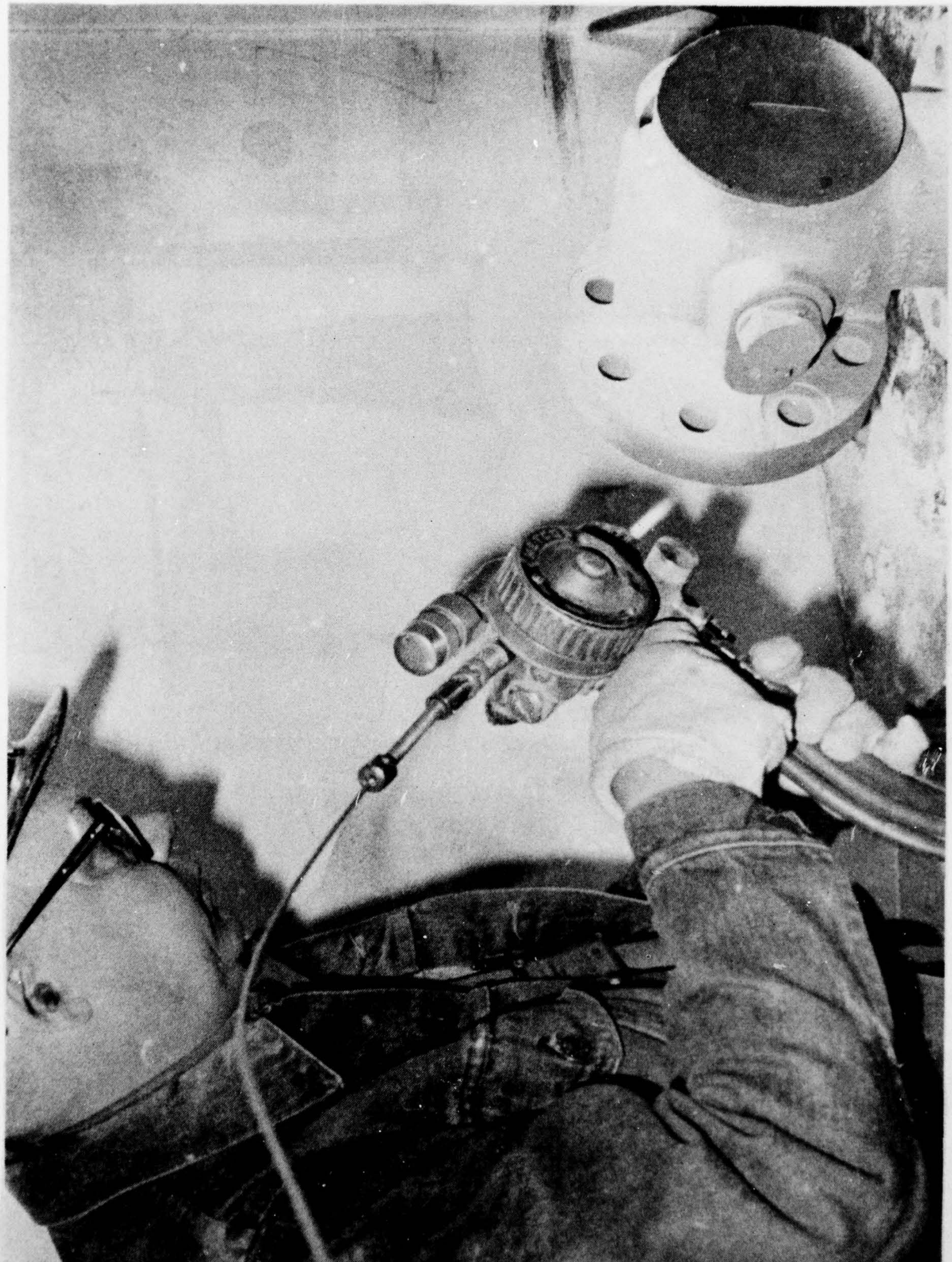


FIG 39

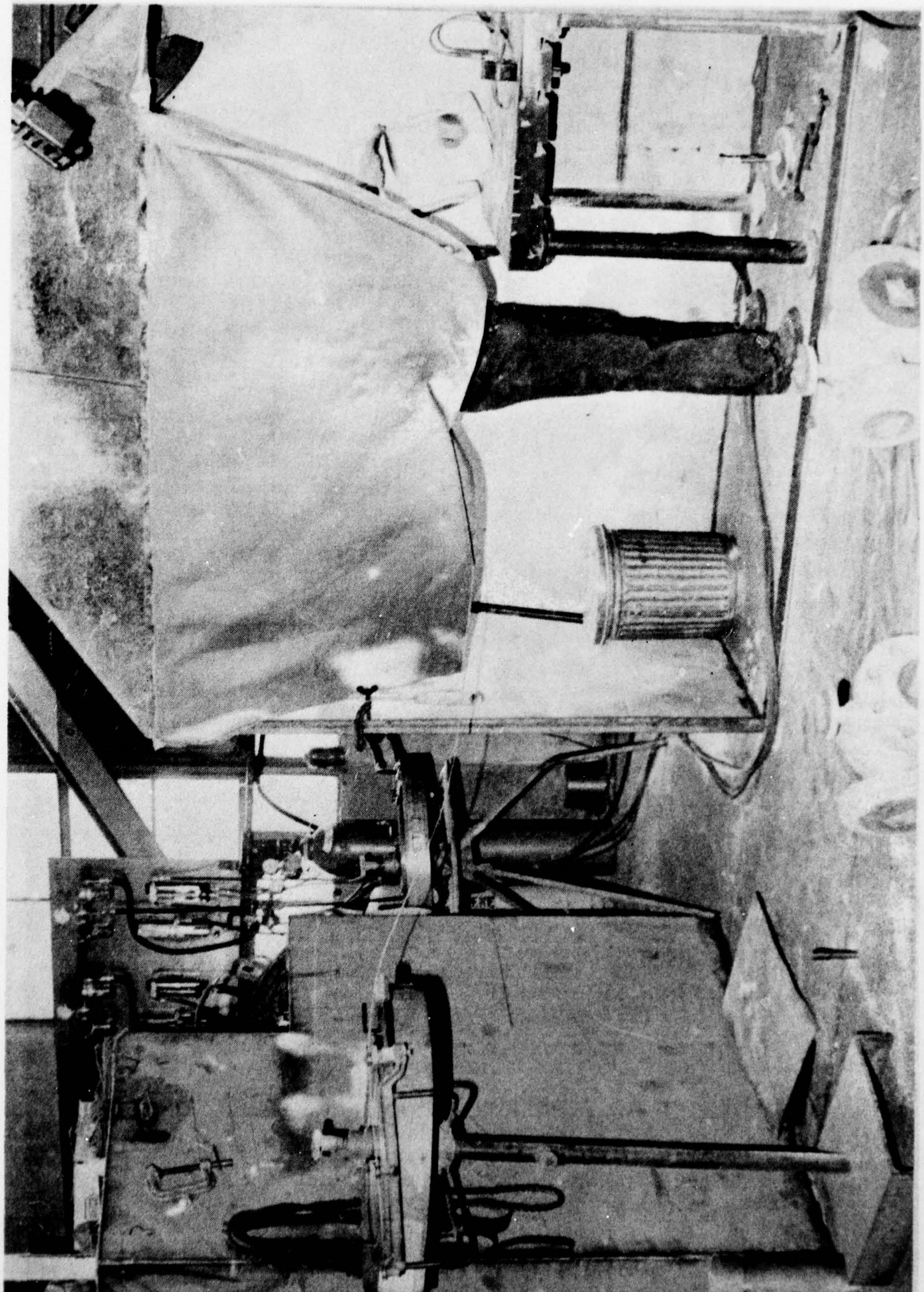


FIG 40

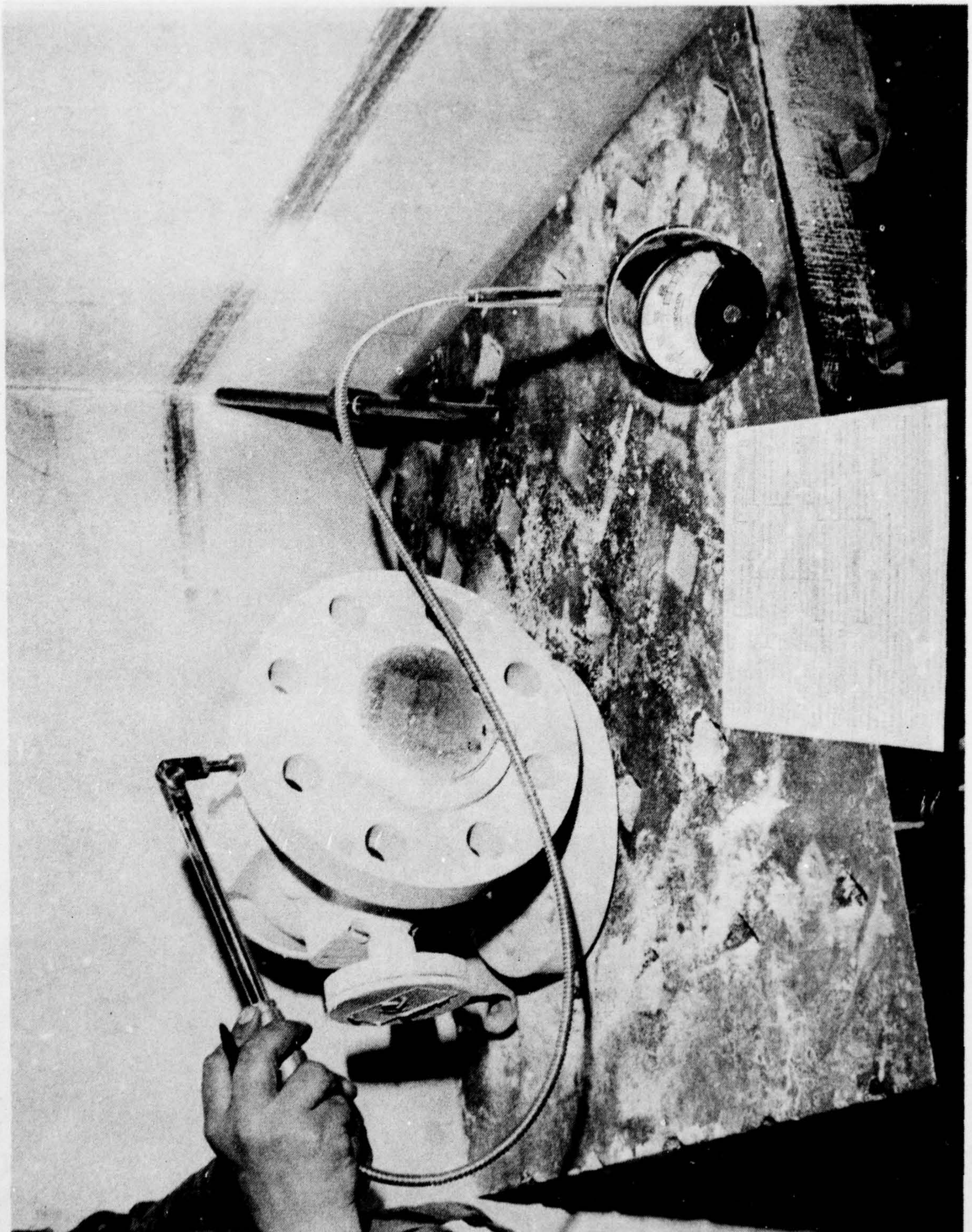


FIG 41

FIG 42

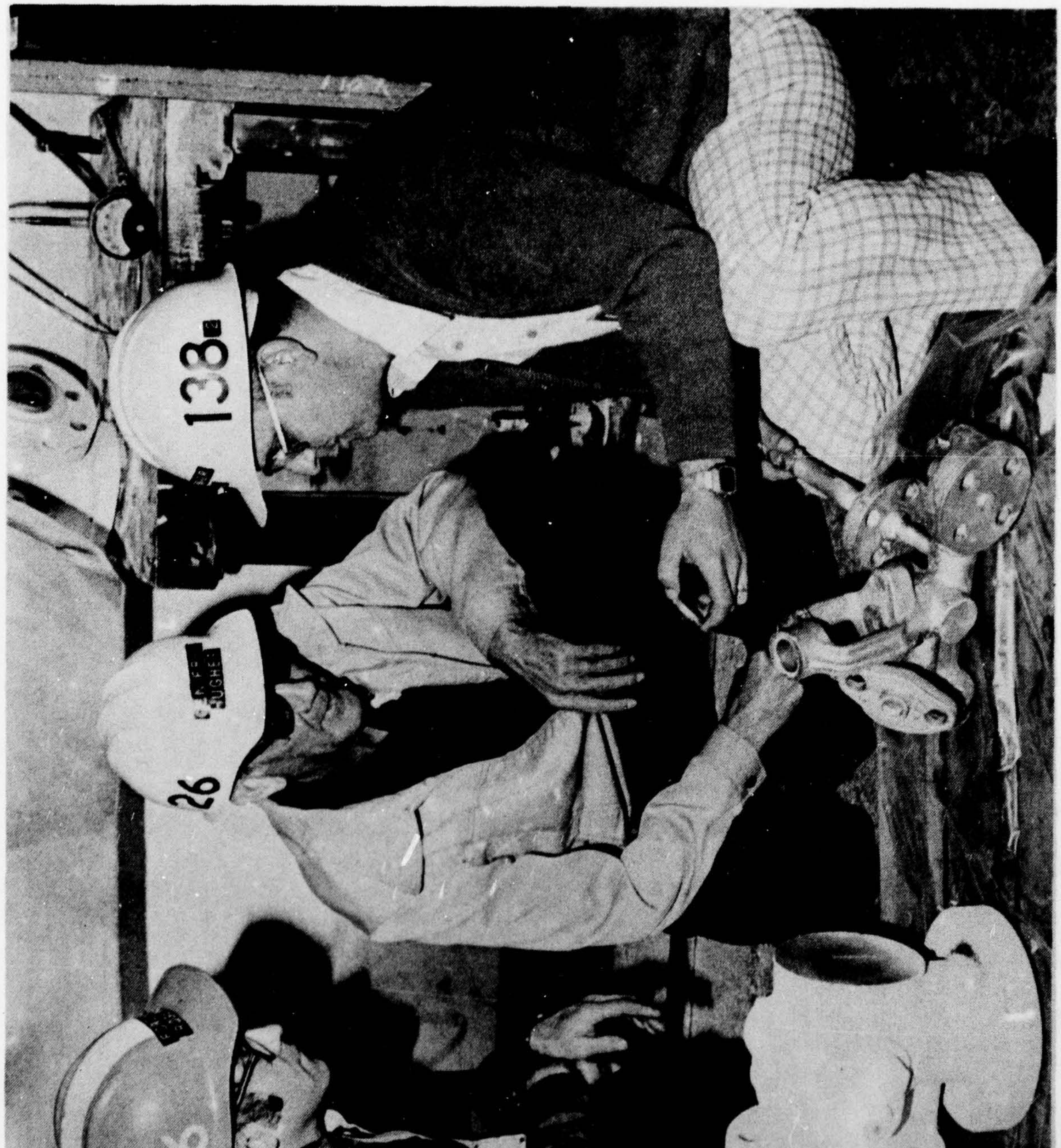


FIG 43

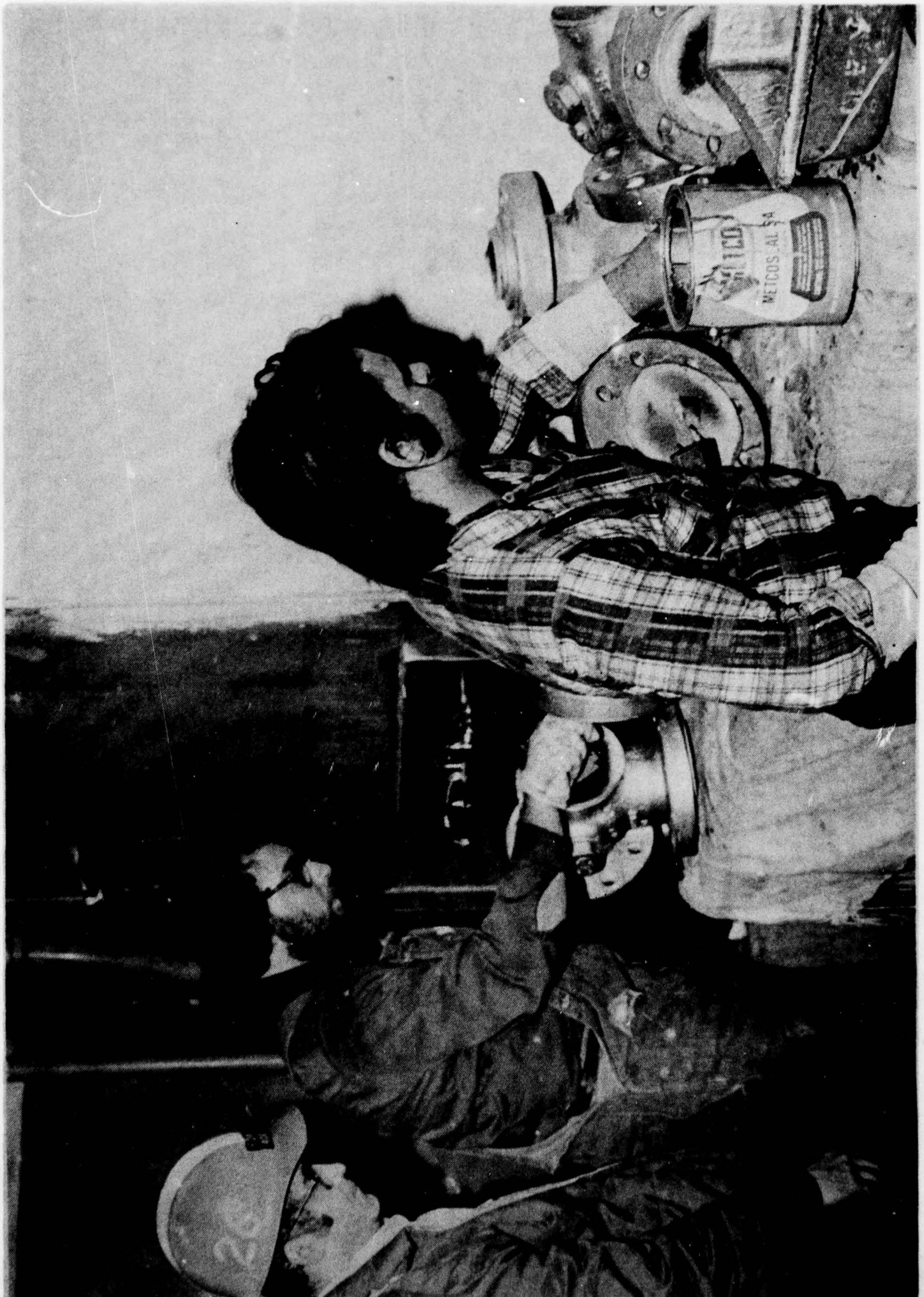


FIG 44

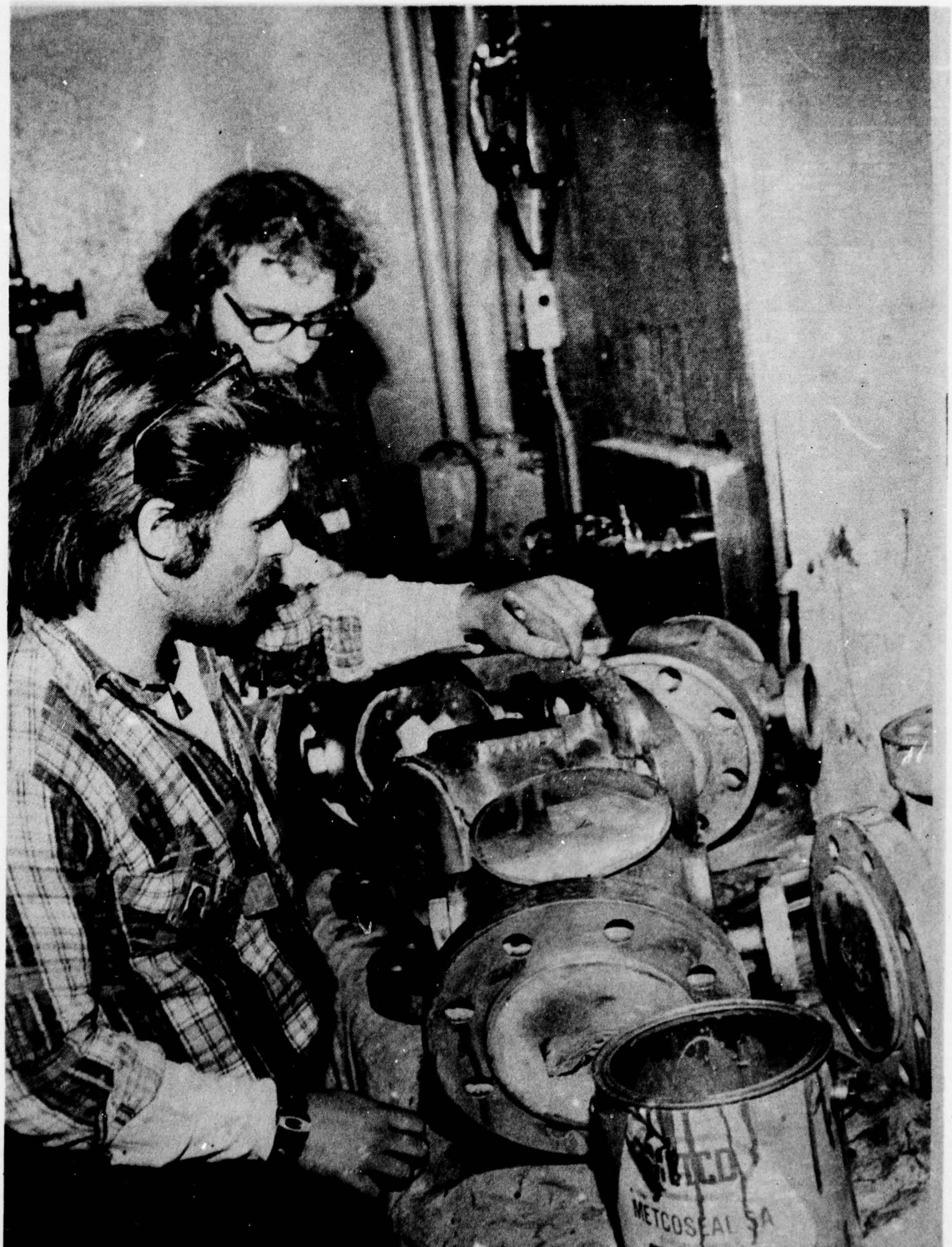


FIG 45

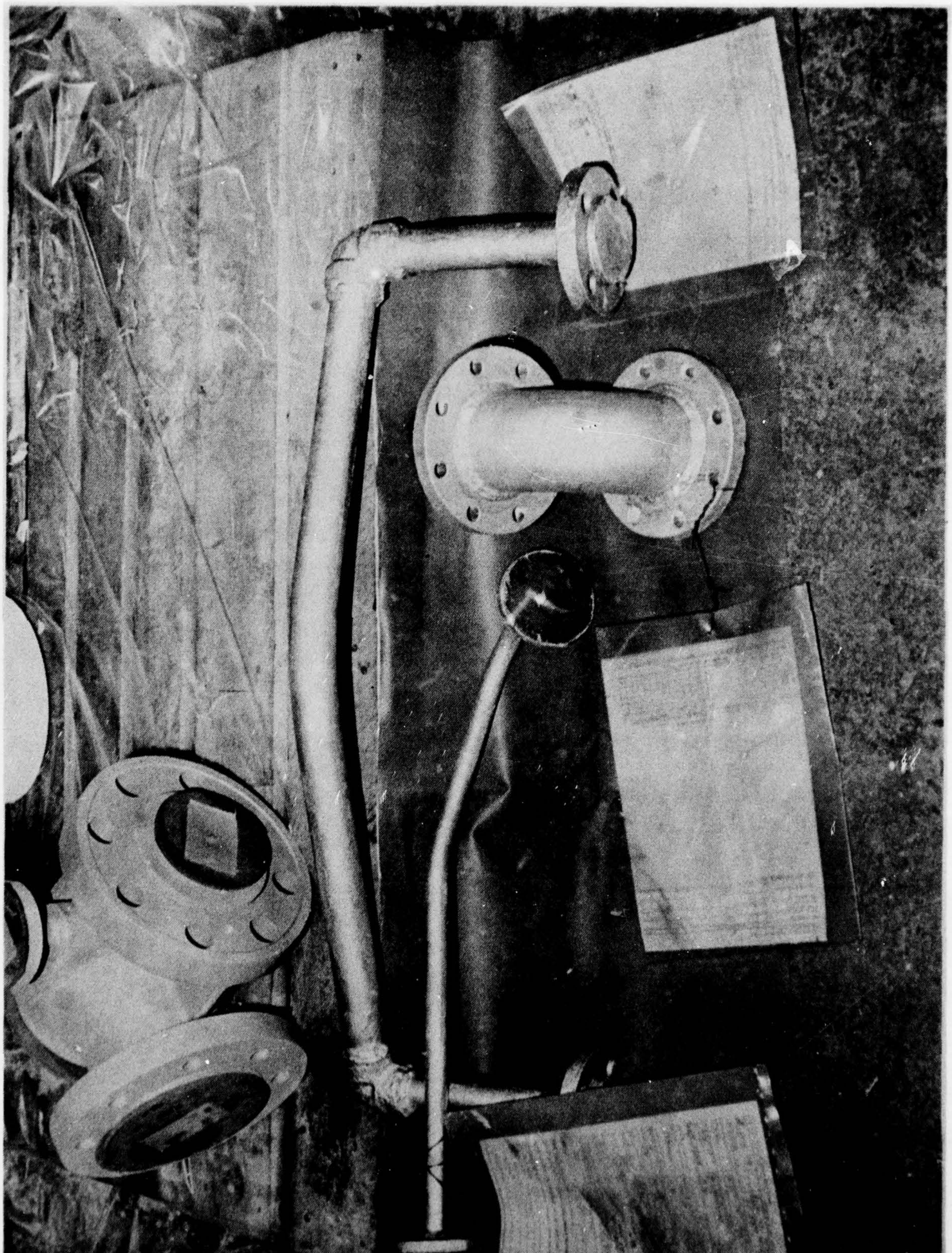


FIG 46

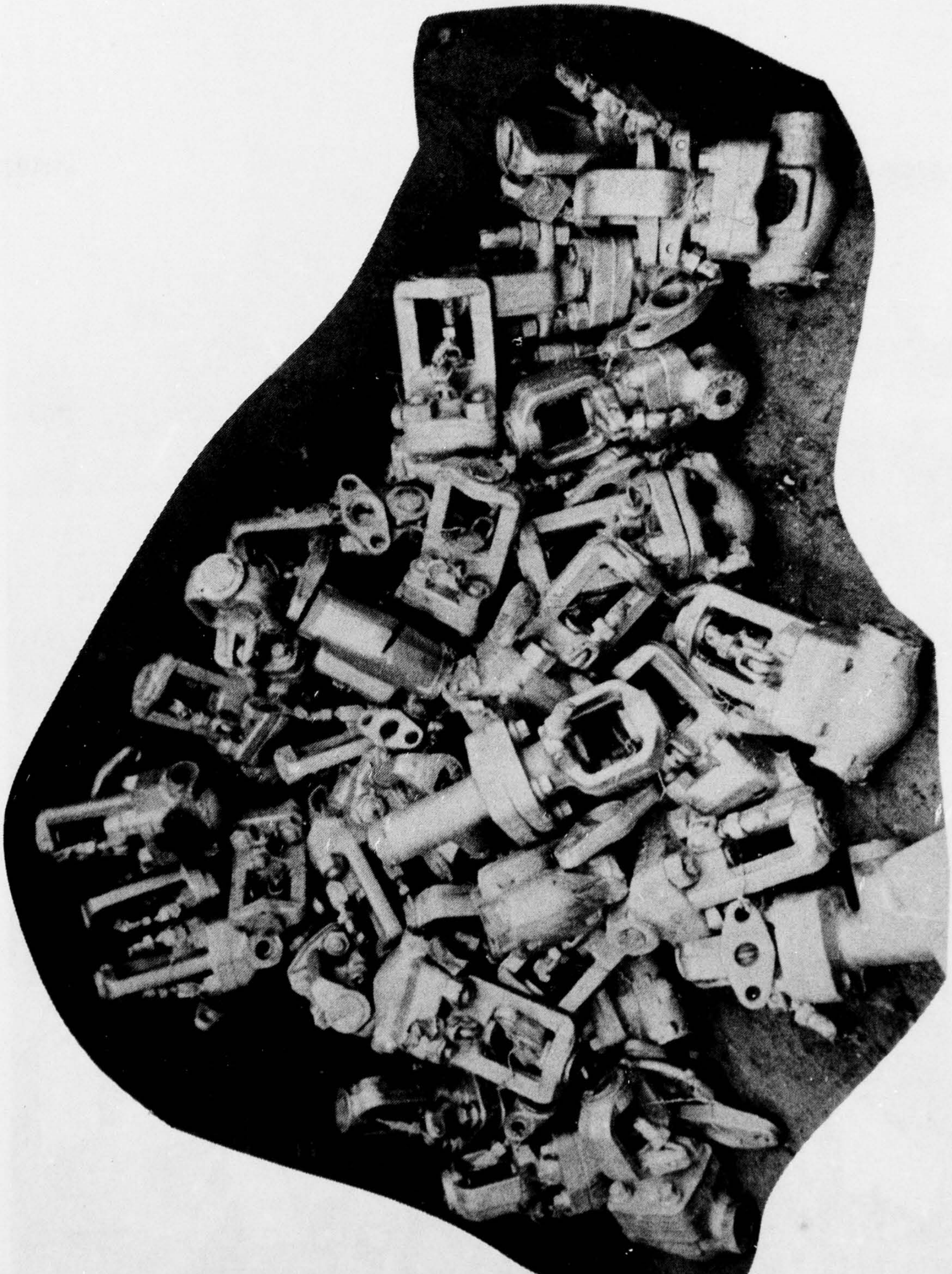


FIG 47

FIG 48

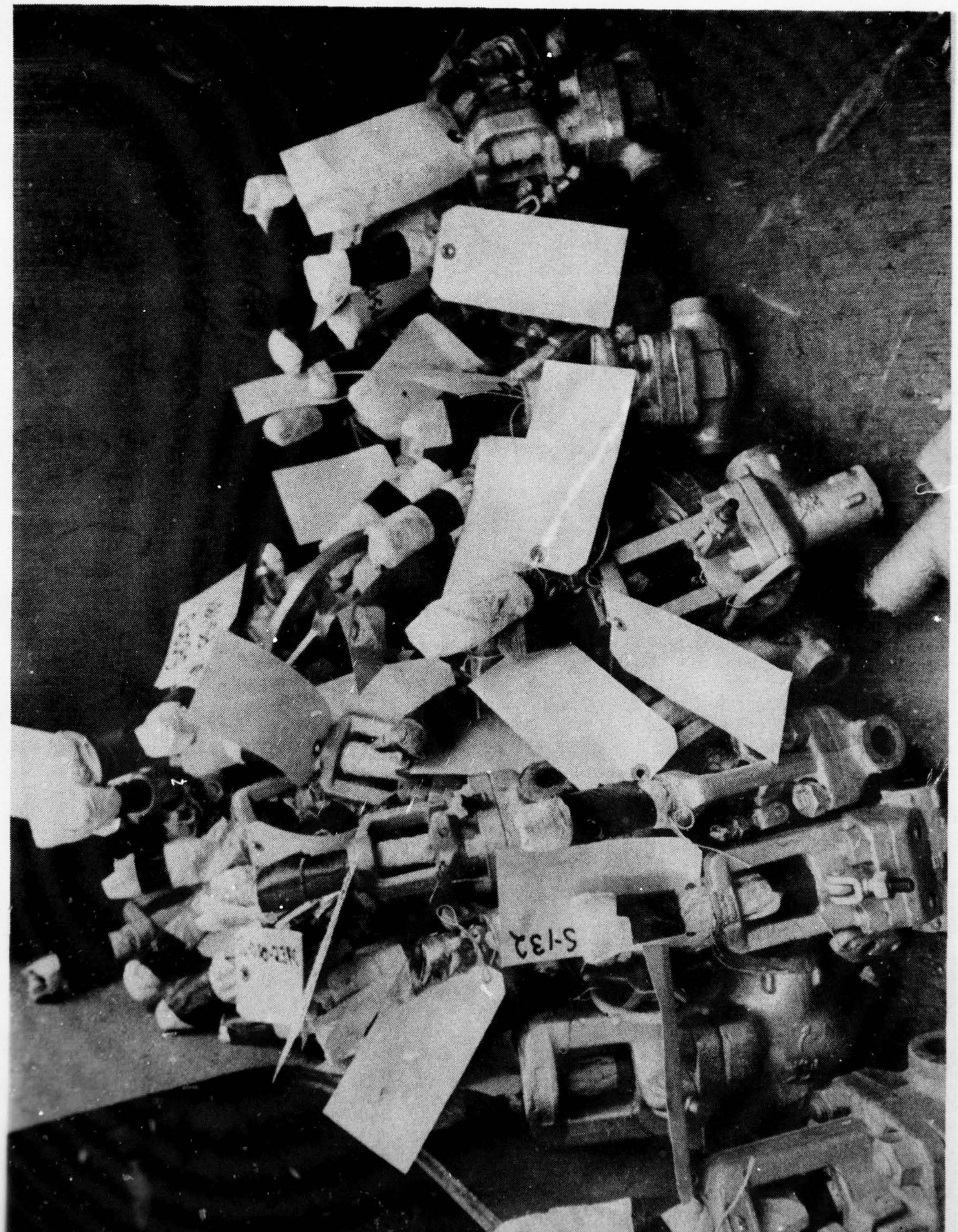


FIG 49

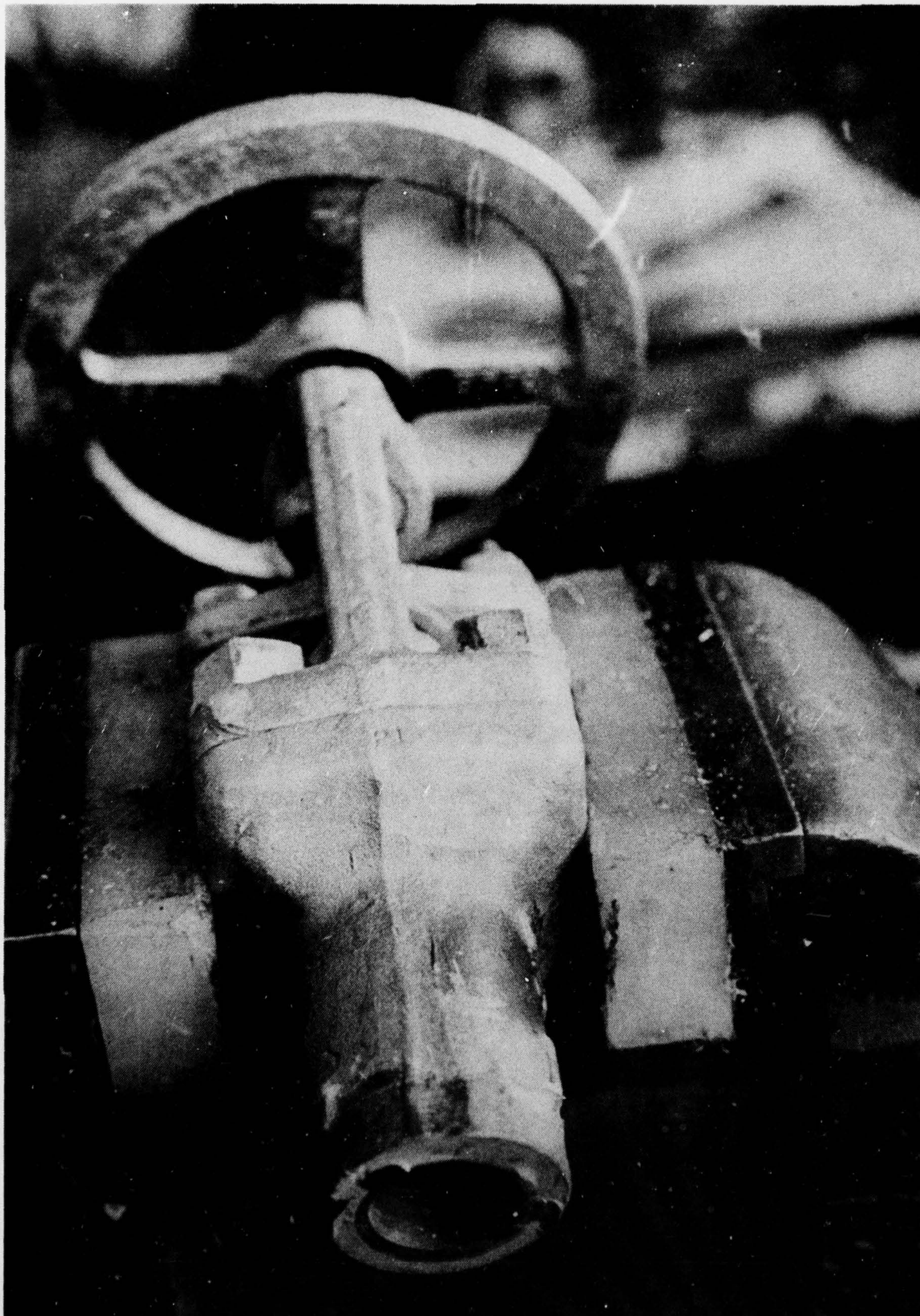


FIG 50

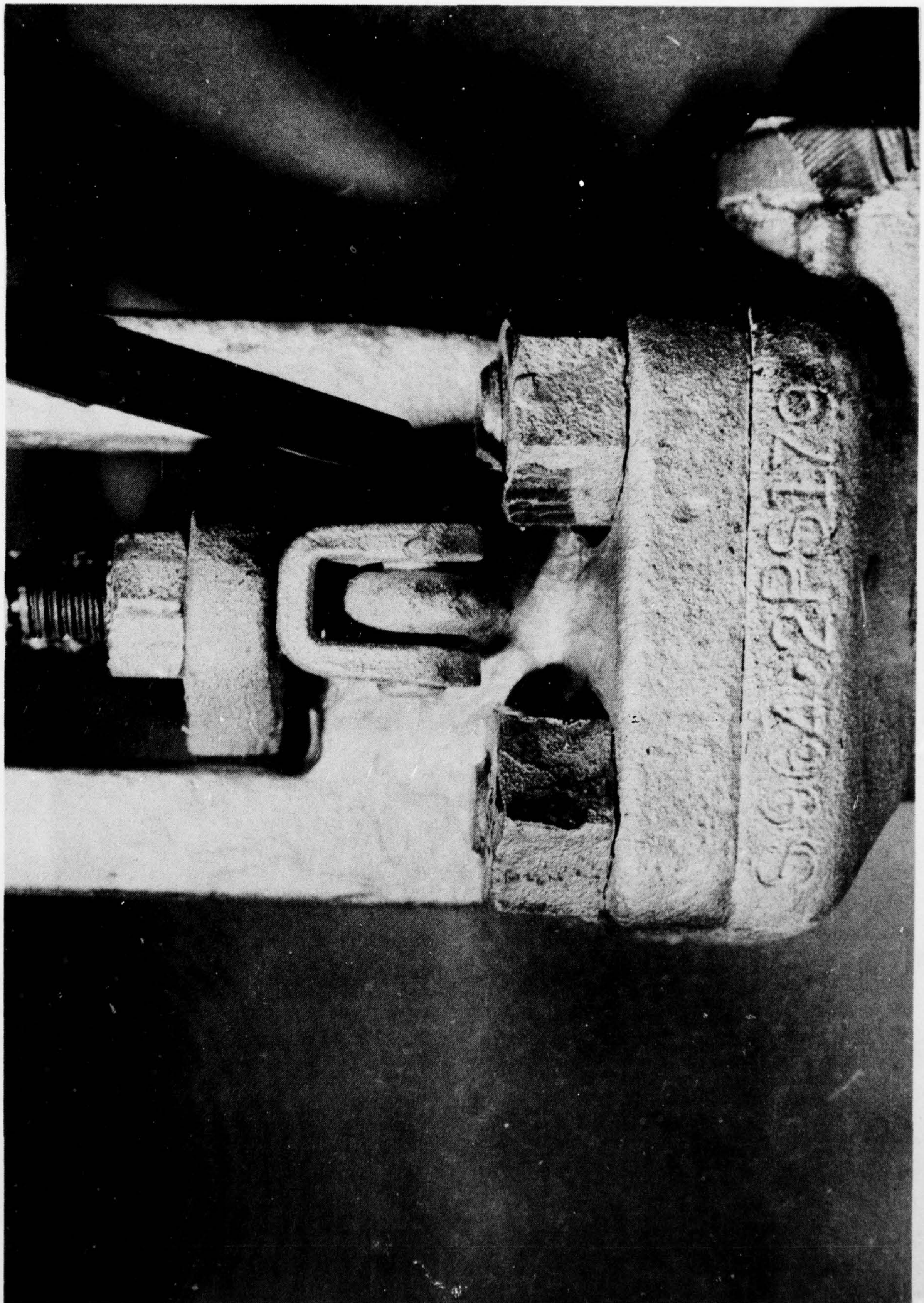


FIG 51

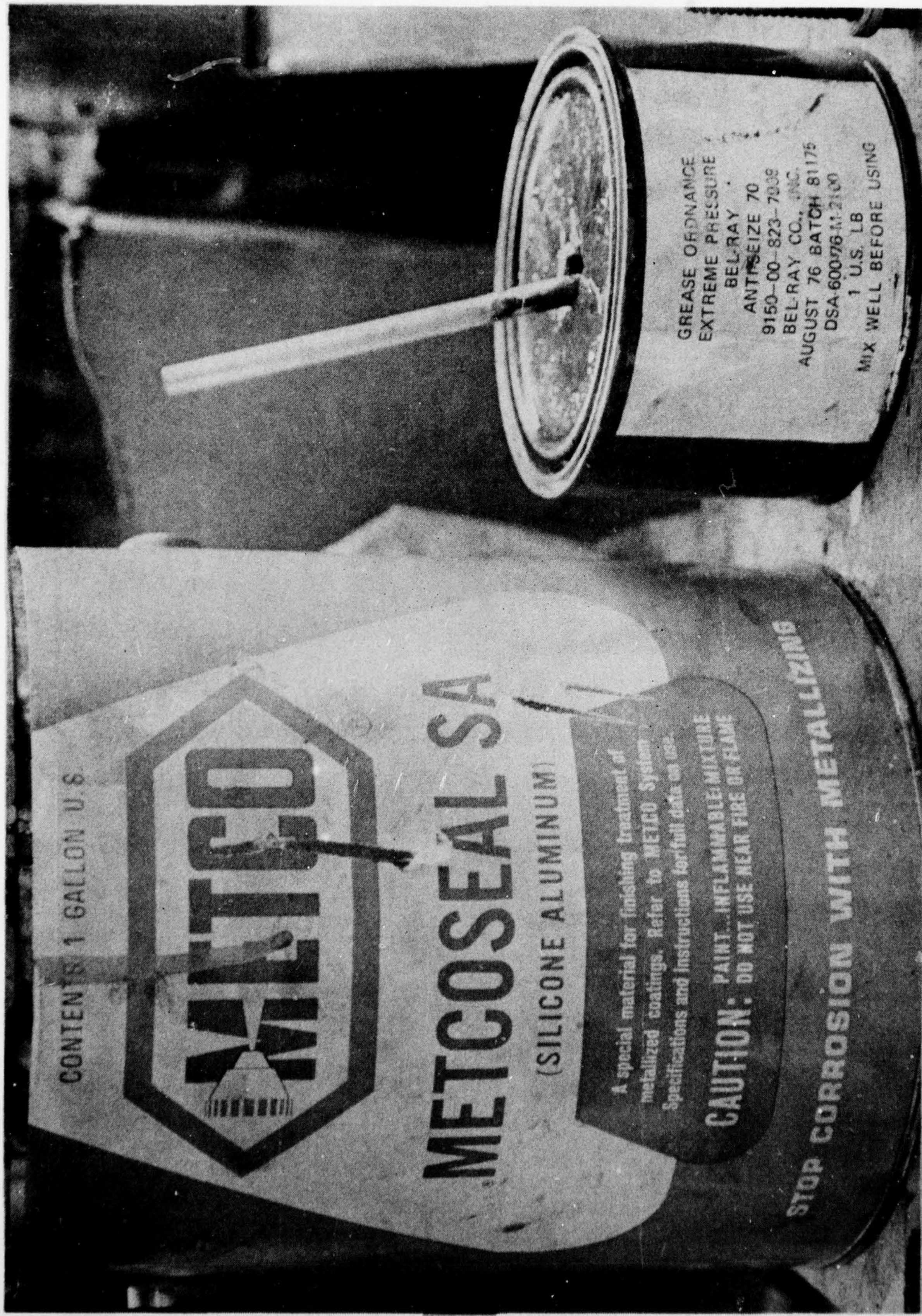

CONTENTS 1 GALLON U.S.
METCO
METCOSEAL SA
(SILICONE ALUMINUM)
A special material for finishing treatment of metallized coatings. Refer to METCO System Specifications and instructions for full data on use.
CAUTION: PAINT...INFLAMMABLE MIXTURE
DO NOT USE NEAR FIRE OR FLAME
STOP CORROSION WITH METALLIZING
GREASE ORDNANCE
EXTREME PRESSURE
BEL-RAY
ANTISEIZE 70
9150-00-823-7909
BEL-RAY CO., INC.
AUGUST 76 BATCH 81175
1 U.S. LB
MIX WELL BEFORE USING

FIG 52

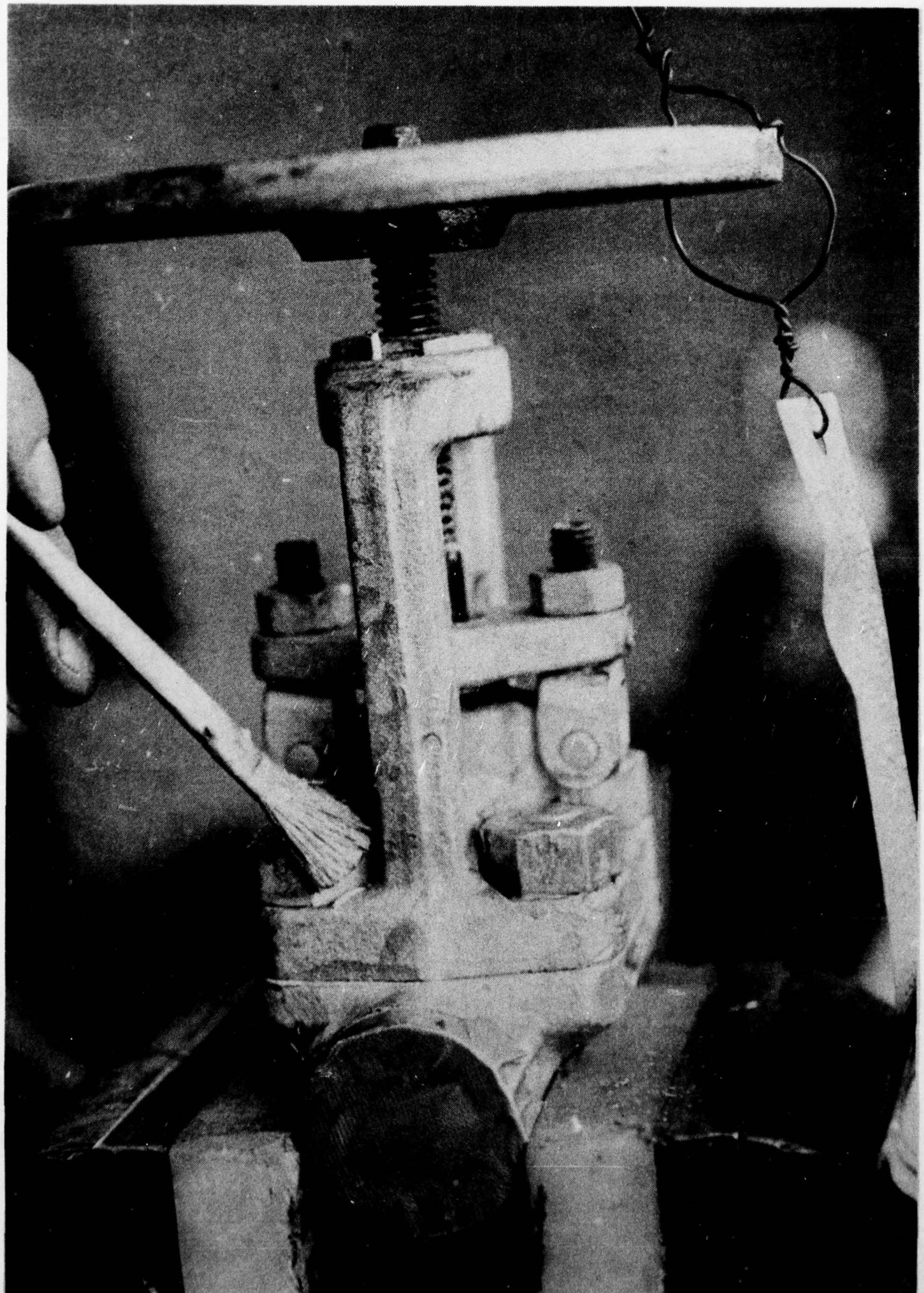


FIG 53

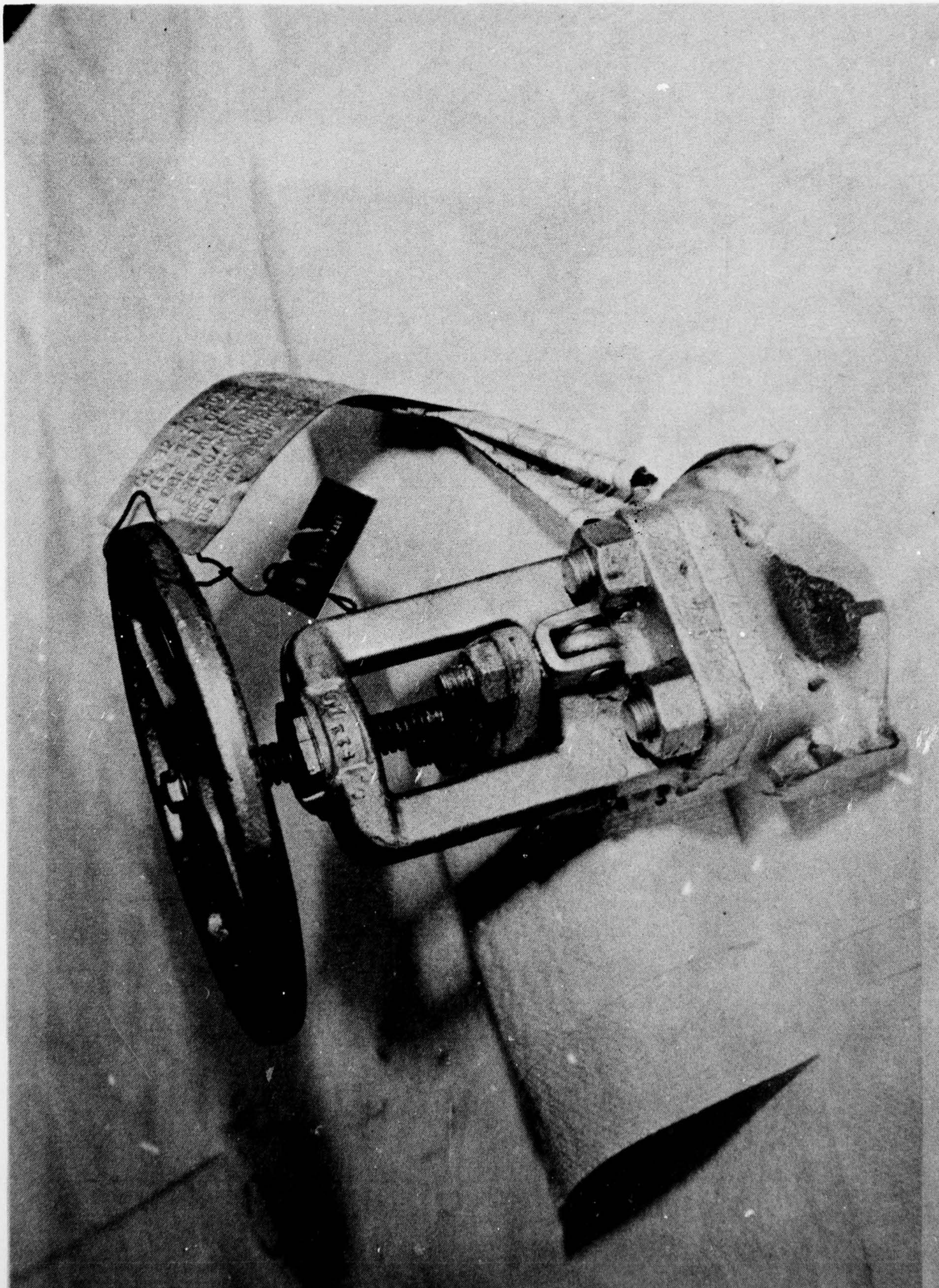


FIG 54

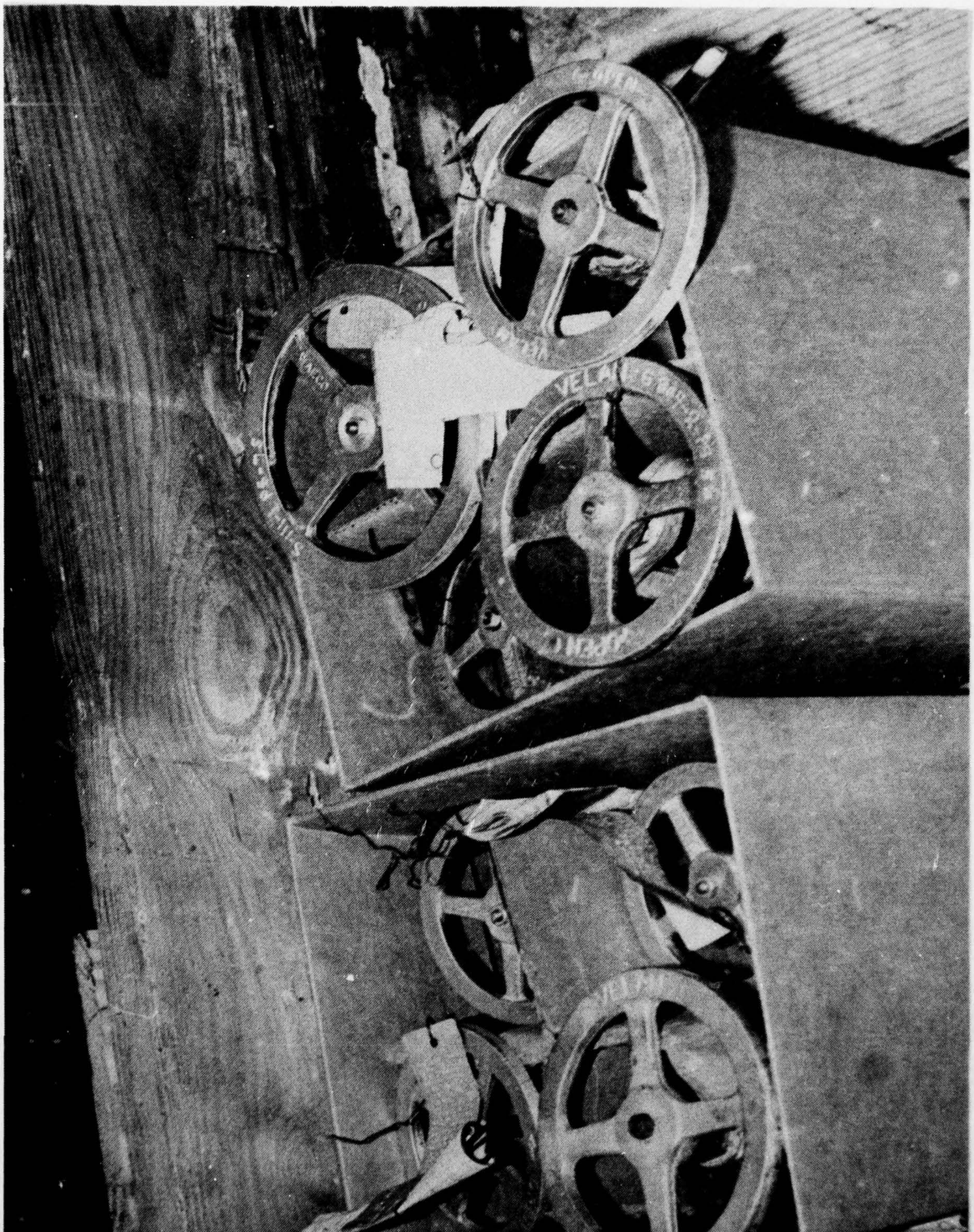


FIG 55

FIG 56

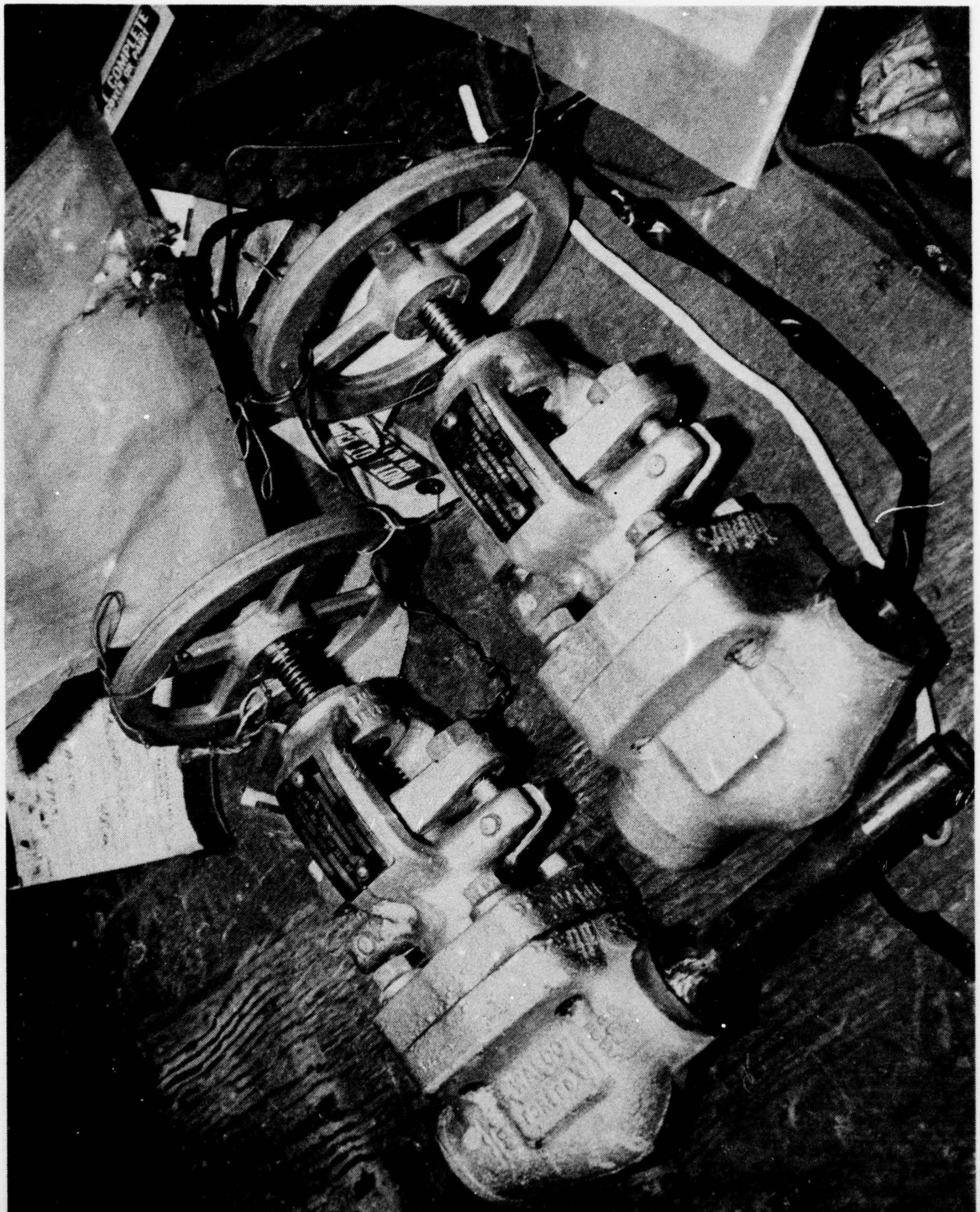


FIG 57

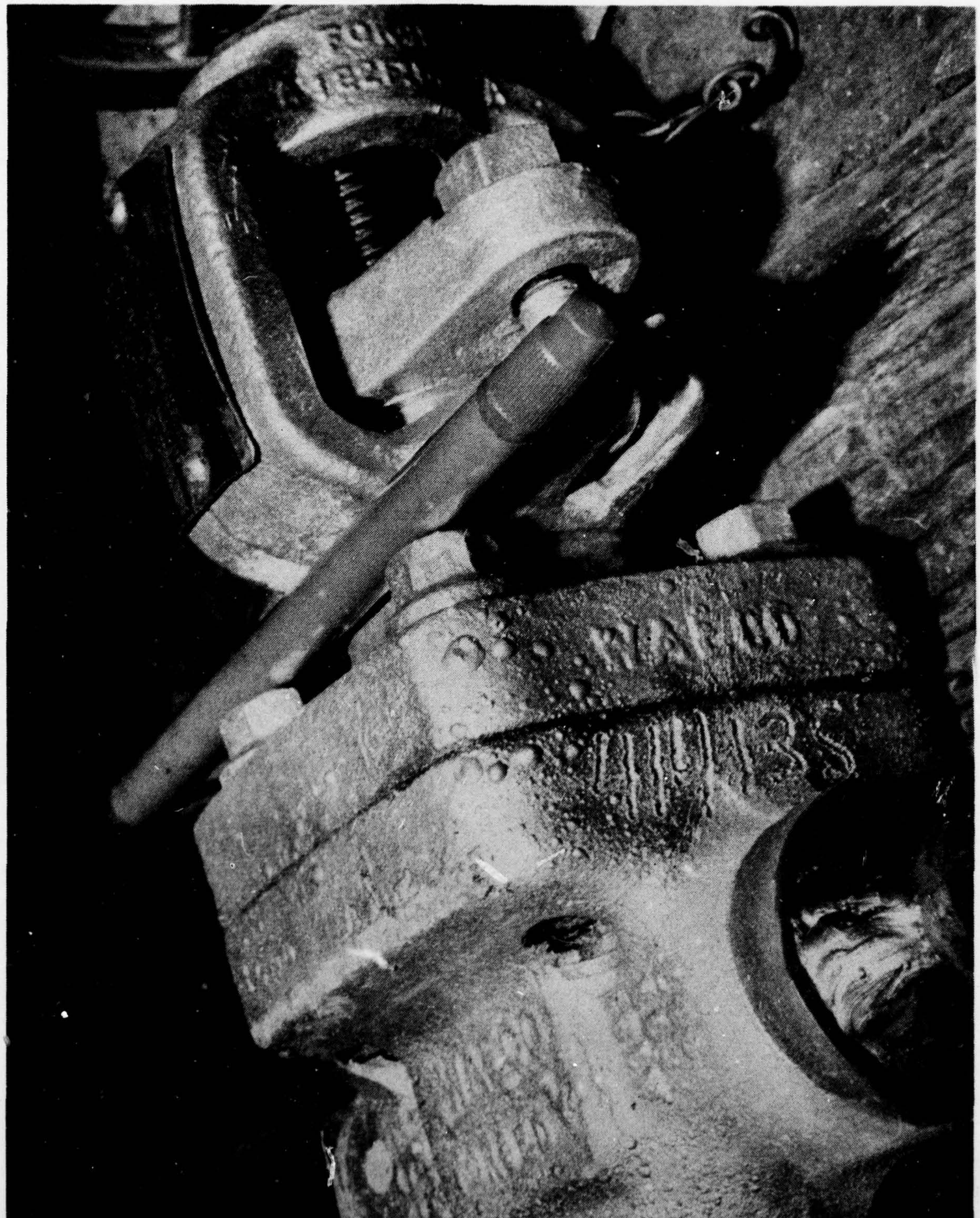


FIG 58

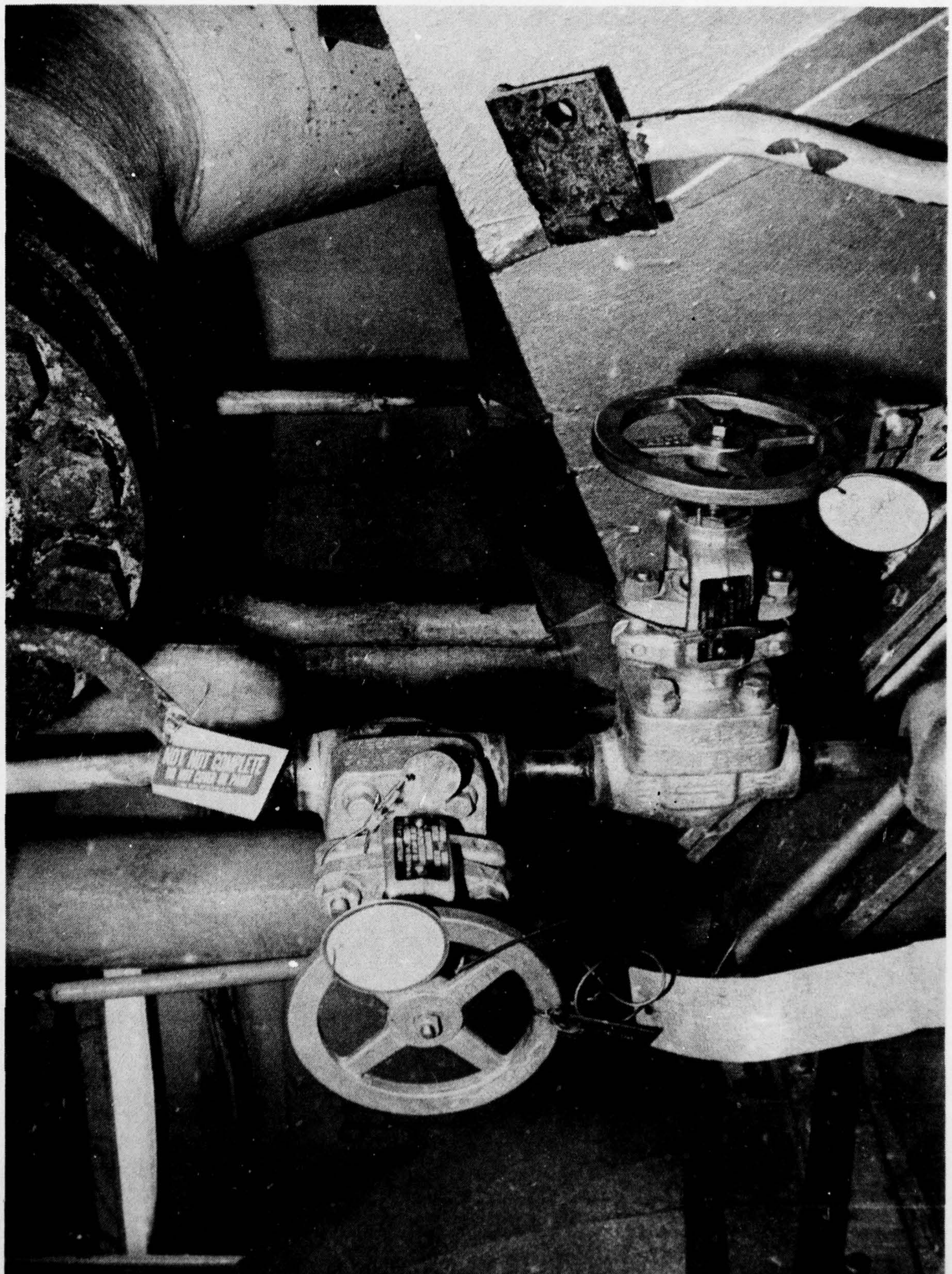


FIG 59

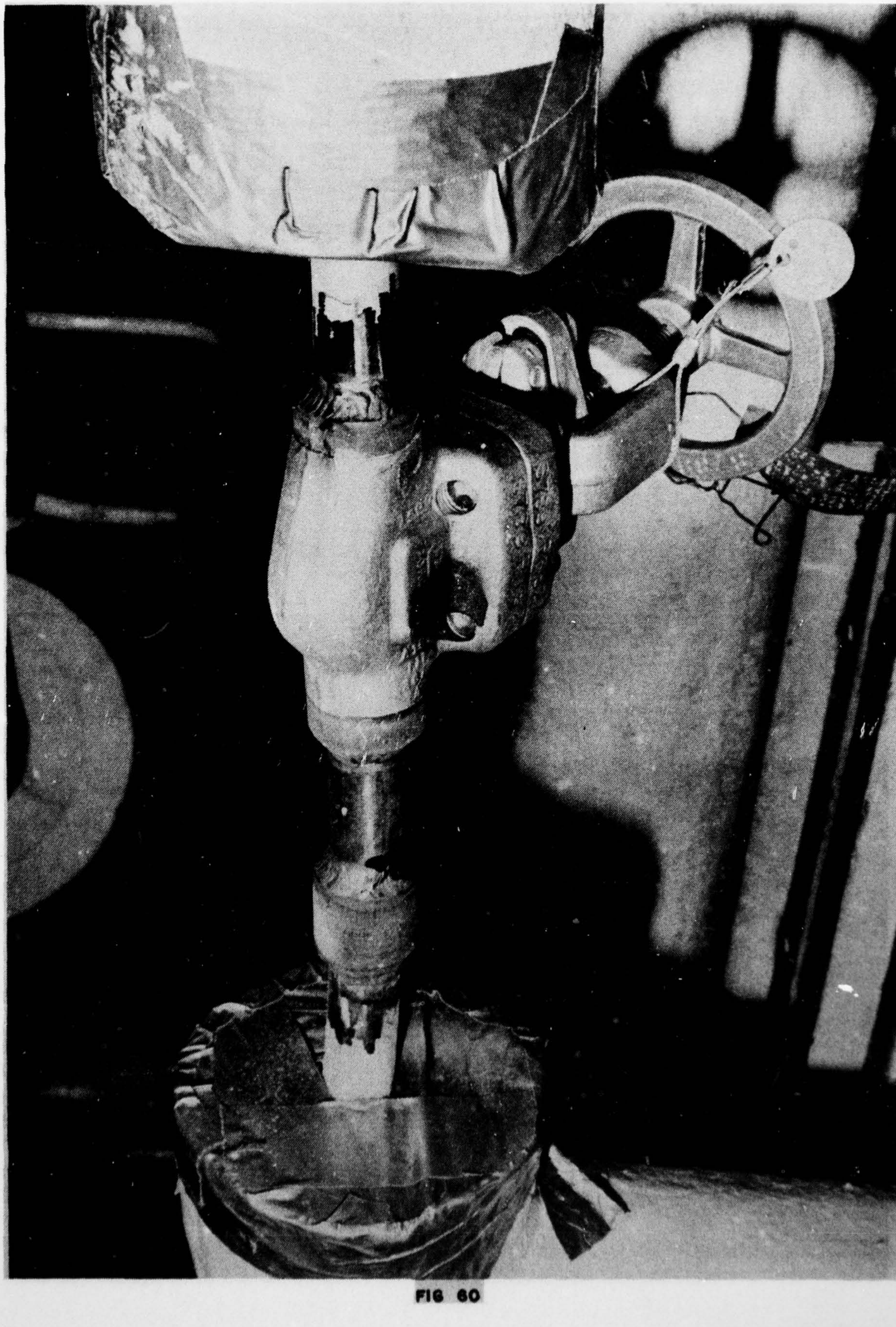


FIG 60

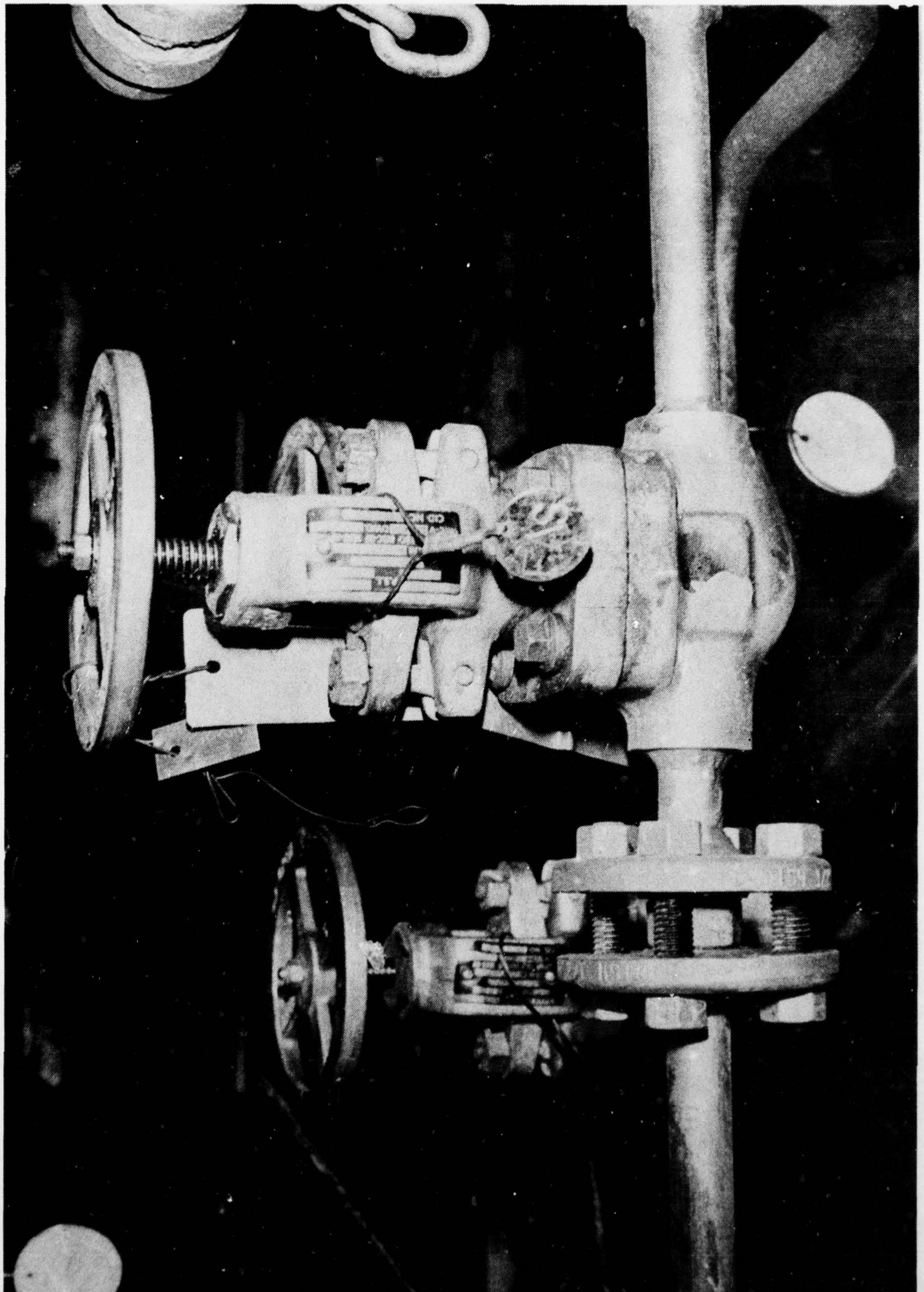


FIG 61

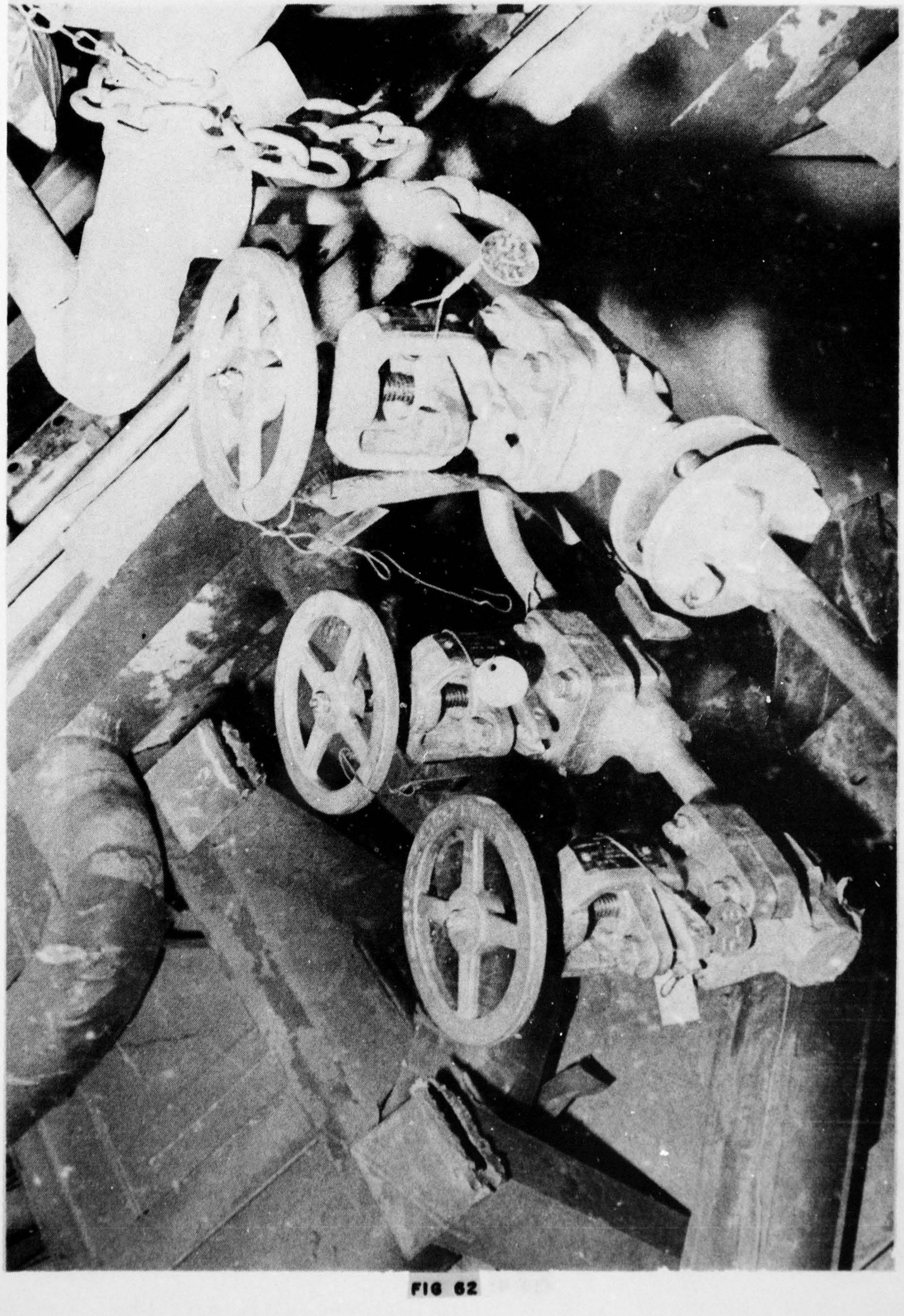


FIG 62

AD-A062 704 PUGET SOUND NAVAL SHIPYARD BREMERTON WASH F/G 13/10
ALUMINUM WIRE SPRAY METALLIZING SHIPBOARD COMPONENTS FOR CORROS--ETC(U)
JUL 78 W H STANDLEY, M D SCHMELLER

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2 OF 2
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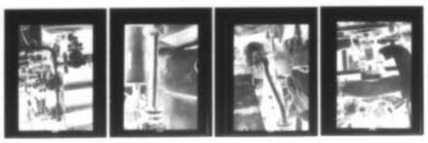

END
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3-79
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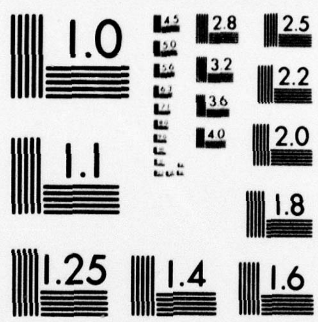

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

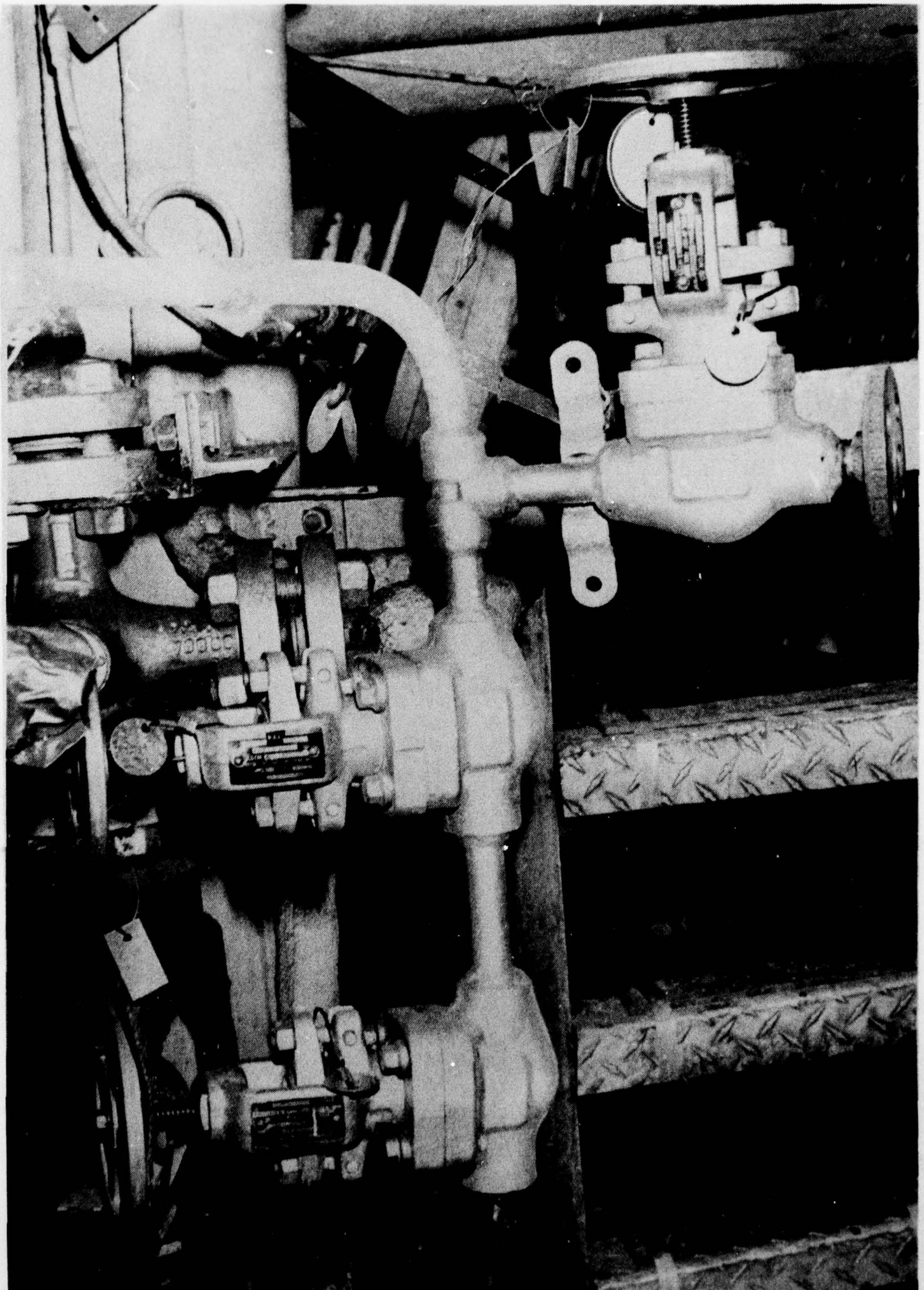

FIG 65

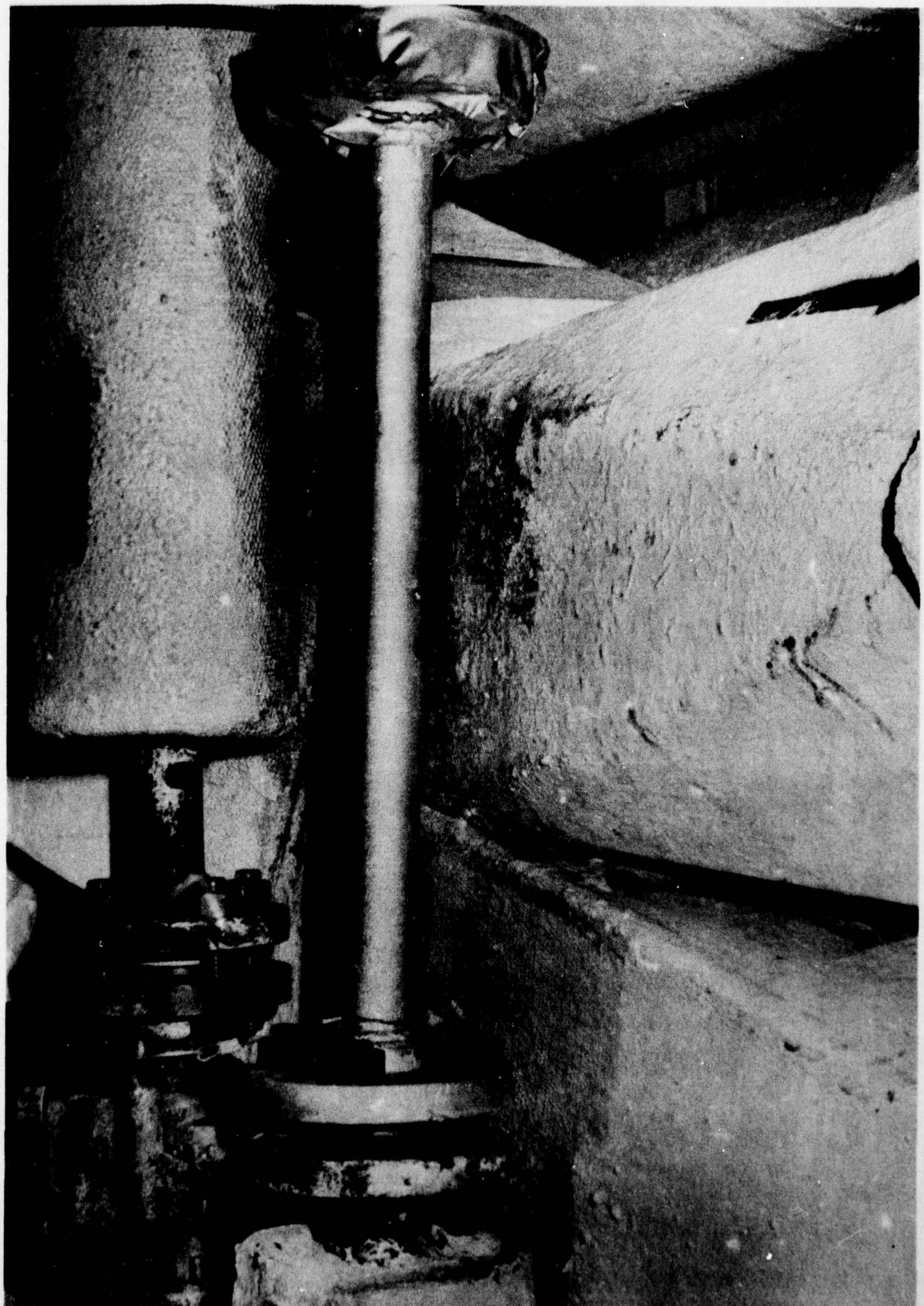

FIG 64

FIG 65

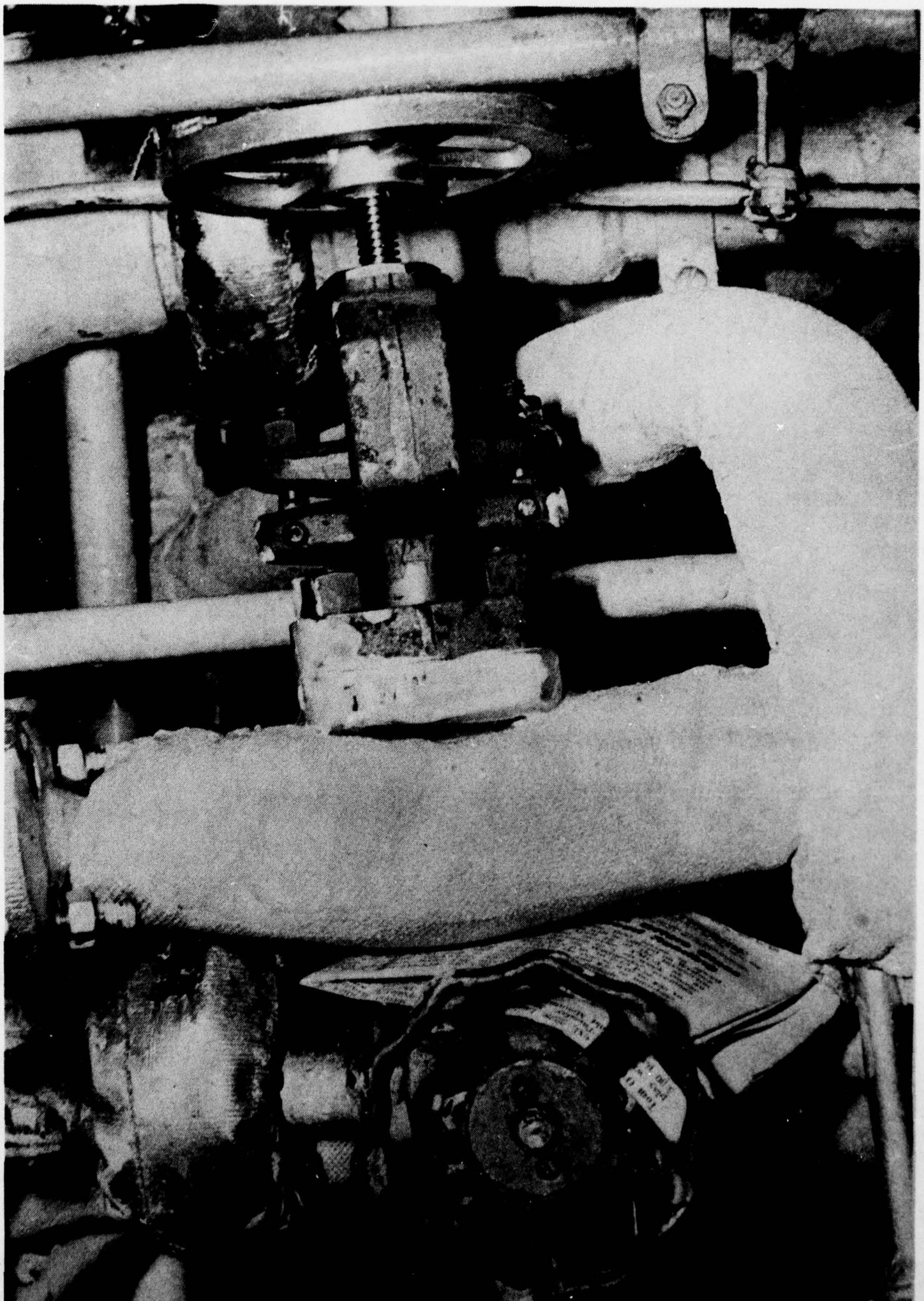

FIG 66